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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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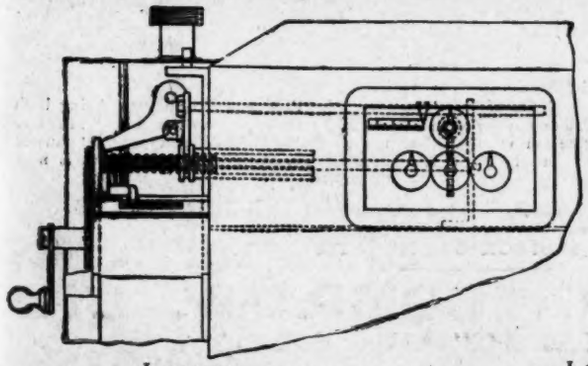

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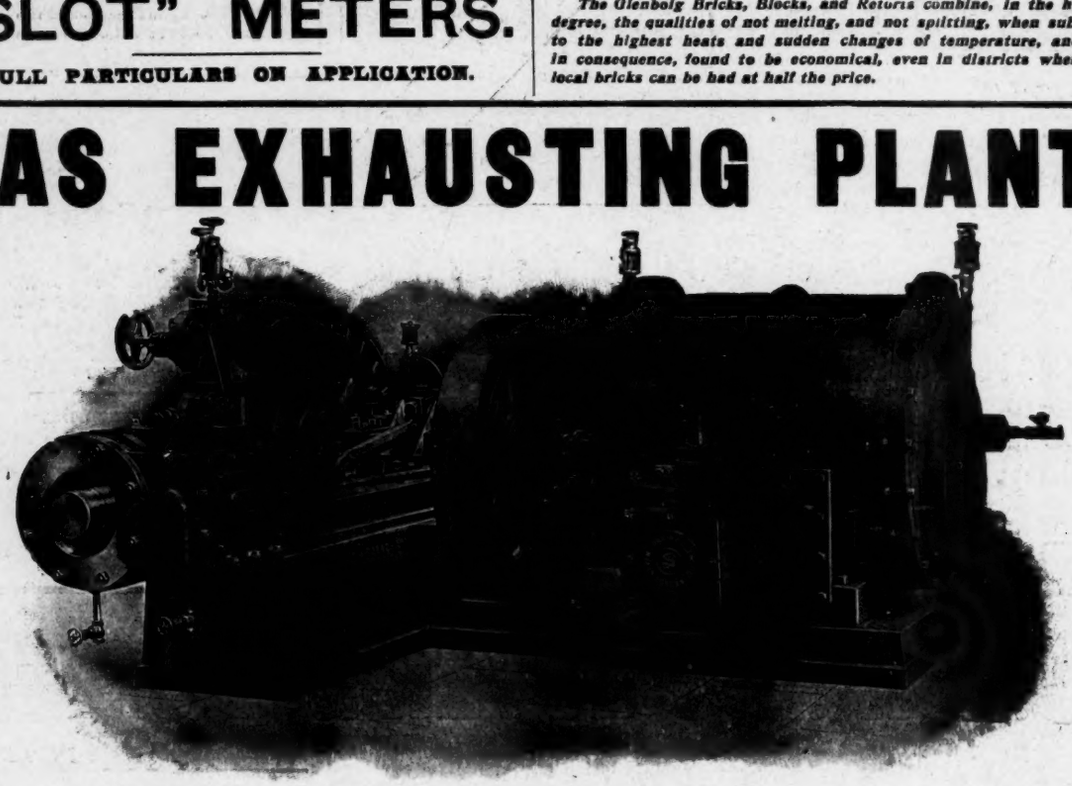

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VOL. CXXXVII., No. 2810.] TUESDAY, MARCH 20, 1917. [69TH YEAR.

EDITORIAL NOTES.

Three-Month Coal Contracts.

THERE has been some uneasiness in the gas industry, which is just emerging from a struggle with the adversities of a bad winter, including vagarious coal deliveries, over the notice issued by the Coal Mines Controller (Mr. Guy Calthrop), asking coalowners, factors, and merchants to refrain at the present time from making forward contracts for a longer period than three months [*ante*, p. 528]. Before this notice was promulgated, inquiries were proceeding, and negotiations were pending, for new gas coal contracts; and it has placed both sellers and buyers in a state of perplexity and indecision. The reason given for this move by the Coal Controller (which must create a considerable amount more work and constant uncertainty between the contracting parties) is that it is "becoming urgently necessary that "special efforts should be made to relieve the congestion "of transport on the railways, and, with this in view, the "need for limiting the scope of future commitments will be "obvious to all." There is something else that is obvious to the managers of gas undertakings, the coal requirements of which are largest in winter and smallest in summer; and it is that, unless they are allowed to make contracts farther ahead than three months, and so be in a position to put to the best of use their coal storage facilities during the summer, the very object of the Coal Controller would be defeated, and railway congestion would be promoted during the winter, whereas it would be relieved to the extent of the quantity of coal put into store during the open months of summer.

However, we are in a position to give reassuring information on this point from the Coal Controller's Department. Mr. Guy Calthrop and those collaborating with him are fully alive to the necessity of building-up stocks during the next few months; and this matter is already receiving their attention. This is satisfactory; and so is the further statement we are authorized to make, that "in any steps taken "in the direction of reorganizing transport, the necessity of "maintaining coal supplies to gas undertakings will be fully "borne in mind." Beyond this it is known that one large gas undertaking has made inquiries as to its position, and has been advised to proceed with the making of its contracts as usual for the twelve months, subject to any decision that the Coal Controller may arrive at later. It is clear that the Department has well before it the special circumstances of the gas industry.

It is a good thing that this is so, and not only in regard to the promotion (by storage during summer) of the object in view—the relief of railway congestion—but on other grounds. For instance, in his notice the Coal Controller says that, in the national interest, there should be a sustained effort "to ensure that all descriptions of coal be pur-"chased from collieries situated as near as possible to the "consuming points—thus securing the minimum of haulage "and resultant economy in the use of wagons and loco-"motives." This is excellent in theory, and excellent also in practice, if feasible. It is manifest that gas undertakings would, in their own economy, purchase the coal best suited to their purpose, with a very open eye on the saving of railway charges, and the shortening of the journey between the coal-pits and the gas-works, in these days when they know that in every unnecessary mile separating the two there lurks additional danger of delay. By the way, the dangers and delays of the sea have also made it imperative for certain gas concerns round about London to rely upon carriage by rail as well as by sea. However, it is quite evident that the hundreds of gas-works south of the Midlands, in the neighbourhood of London, and in the south-eastern and the more southerly counties cannot all be supplied by the geographically nearest collieries. There is another point. The southern gas undertakings, having to bring their coal a long distance, naturally desire the best for their purpose; to have inferior qualities delivered to them means that larger quantities are needed, and therefore more wagon accommodation. It is often a railway economy as well as a gas-works economy to convey better coal than the poorer qualities for gas-making purposes. In other words, it should be recognized by the Coal-Controller's Department that, owing to the variety of products the gas industry is called upon to realize from the coal carbonized—including the products necessary for explosives making—quality tells; and quality is a factor in determining the quantity required. This distinguishes the gas industry from other coal-using industries, which totally destroy the coal they use for steam-raising or heating. Furthermore, the requirements of gas undertakings being on similar lines, and the conditions of their working being fairly uniform (other than quantitatively), suggest that reasonable distribution and not unreasonable concentration of the needs of the numerous concerns situated a distance from the coal-fields is distinctly one way of obviating railway congestion.

Let us say, in conclusion, that the gas industry very fully appreciates the need in these times for carefully considering the conditions of coal supply and railway conveyance, and endeavours to deal with them from the point of view of the national interest. But it is not difficult to see that three months' gas-coal contracts, the attempt to adhere to geographical rules in regard to sources of supply, and the compulsory use of coal of a lower qualitative value, would, for reasons already stated, combine to entirely frustrate the object the Coal Controller has in view, besides being disastrous in other respects. At the same time, the industry will be prepared to aid the Controller in every way possible, and the best way possible is to consider and act in accordance with its special circumstances. In conjunction with this, it may be presumed that now there is effective Government control of the coal industry, there will be no question that contract prices will be made, as near as is possible, in accordance with the spirit and intention of the Price of Coal (Limitation) Act. If this is the case, there should not be any repetition of the unpleasantness and dissatisfaction that arose last contract season over interpretations and evasions of the Act—the latter due to ownership of the coal placing in the hands of the colliery proprietors a power of refusal and disposal which operated against buyers but in favour of the profit of sellers.

Generally on the coal position, at the moment there is little gas coal going begging. If there is any, it is up Durham way, through the export licence control, shipping shortage, and other trade-debarring difficulties. The recent depletion of gas-works stocks through the flights in demand for gas owing to the severely cold weather, has caused many spare lots of gas coal in other quarters to be picked up rapidly and at high prices. But though this may be an imperative mode of replenishing stocks to a point sufficient for current protection, it is as a rule in these days a very expensive one. As to the coming months, of this every gas manager may be assured, that his compeers all over the country will (subject to the regulations of the Coal Controller) be using every available means between now and the end of the autumn to endeavour to put themselves for next winter beyond the trials and difficulties that transport, labour, and arctic weather this past winter combined

to bring upon them in full force. The managers who last year complained of increased costs due to larger coal storing during the summer months, and regarded prudence from a minor standpoint, will look upon the accumulation of even bulkier stocks for the coming winter in a most philosophic spirit, and will try to obtain them. But whether they will succeed is another matter. No gas manager who lately was measuring his remnant coal stock by days (and in some cases hours) will want, if it can in any way be avoided, a repetition next winter of the experiences of this last one. And he will do his best not to get it, though in some cases there may be disappointment.

Relation of the Calorific Power of Gas to Fuel Economy.

It is one of the curiosities of statutory enactment affecting British gas supply that our learned legislators are constantly attempting to stereotype (and they do so up to a point) the quality of gas, but that in the last decade the stereotyping has only had comparatively short duration. Not even legislators can stop the natural evolution of things; and thus it is that Parliament, who not many years since insisted on the supply of 16 and then 15 candle gas tested by the "London" No. 1 argand, to-day allow the distribution of a quality of gas that is altogether different from what it then was—gas in some cases almost denuded of luminosity, but a gas of all-round useful calorific value. Now, notwithstanding the partiality of the Board of Trade for gas of 500 B.Th.U., and not lower, we feel that, looking at the trend of development, the time is not remote when Parliament itself, through the investigations now in train in connection with fuel economy, and in the interests of the country generally, will look with favour on B.Th.U. being distributed in the gaseous form at a reduced cost in the bulk, even although numerically diminished per cubic foot of gas low in incombustible ingredients. Only three or four reasons need be advanced for this belief; and these have a national economic basis. It is to the interests of the nation to utilize its own resources to the utmost of practical limits in making the country self-contained in respect of the materials for dyes, explosives, motor fuels, &c.; to promote the economical use of coal in gas-works by the greater gasification of coke for the production of simple water gas for mixing with ordinary coal gas; to keep at as low a level as convenient the importation of oil; and to promote the use of gaseous fuel for industrial and domestic purposes, and so further contribute to national economy, efficiency, and endurance through the health subscribing aid of atmospheric sanitation. These seem to us to be good and persuasive inducements for a Parliament of business men not dominated by slavish attachment to antiquated political traditions.

Various gas undertakings during the past few years have obtained parliamentary authority to supply "power gas." The Sheffield Company are asking for such authority in the present session. A dual supply of gas is quite practicable in a district with a concentration of industrial establishments; but the matter of the supply of a lower calorific value gas requires to be considered from a more general standpoint than the particular conditions of such concerns. It is obvious from the experiences and the new knowledge as to national requirements gained during the war, that the gas industry cannot be of such large service to the country under the *régime* of a uselessly high calorific value as would otherwise be the case; nor under such calorific value can it with the best effect promote the industrial and domestic uses of gas, and so displace with increasing vigour the smoke-producing consumption of raw coal. At the same time, the industry will always be bound to maintain a quality of gas that will be suitable for incandescent lighting; and therein lies satisfaction for those who look with disfavour upon any descent to a calorific value still lower than 500 B.Th.U. gross. The justification for proceeding to a lower level must, under normal conditions, be in two directions—the one that a greater number of B.Th.U. are supplied at a price below what would be the case with a higher calorific gas, and the other that the gas forming the vehicle for the B.Th.U. contains a fairly low percentage of incombustibles. Herein the consumer would obtain a good compensation, in addition to a larger volume of B.Th.U. for a given price, for the further lowering (within reason) of the calorific power per cubic foot.

The first question is, How is this to be accomplished? High makes of gas obtained through over-exhaustion and the supply of an immoderate percentage of inert gases, though the calorific power per cubic foot of gas is right, are to be strongly deprecated. In the letter which appeared in our issue for Feb. 27, Mr. W. R. Herring redirected attention to the growing practice on the Continent and in America, and there are examples also in this country, of the production of a simple water gas of a calorific power of (say) somewhat above 300 B.Th.U., and of good combustible composition. Previous to the war, there was for gas managers a daily dismal view of growing piles of coke that were throughout the country lying unsought and uncared-for by fuel users. The war has caused these to disappear, and has created quite a good demand for steam raising in stationary boilers and for other manufacturing operations, while use is extending for steam motor vehicles—with such good effect in the one direction that long-time contracts for coke are being entered into, and in the other that the Government have authorized the manufacture of coke-driven cars upon an extensive scale. But here, again, the gas undertakings in the industrial areas are in the most-favoured situation; while gas undertakings in other localities cannot, after the war demand ceases, expect very much relief for their coke for these particular purposes. And when coal returns to a cheaper level, there will not be the same demand as now for coke for domestic use; and prohibition of the burning of coal in the domestic grate is not likely to have an immediate realization. Therefore, a good outlet for coke would be for the making of simple water gas for admixture with ordinary coal gas; and this, we have some confidence, will be the line of a large development. With the considerable shortage of coal to-day in Germany—due to output, labour, and transit—this use of coke by gas-works is one of the ways whereby coal economy is sought; and this means of economizing coal in war time is a means of economizing coal in peace times. The policy and the data are, of course, matters for consideration and debate. It is anyway a question that should be brought before the Board of Fuel Research; for progress should not be stemmed, and a very useful fuel be allowed to uselessly accumulate, when it can be turned into a gas that, mixed in suitable percentage with coal gas, is a means of providing a good combustible gas for light, heat, and power, and it may be presumed capable in ordinary times of being supplied at a price below what would be otherwise possible—thus promoting gaseous heating and largely the discontinuance of the consumption of smoke-producing coal. In a double way, this would mean fuel economy—a less quantity of coal required at the gas-works in proportion to the output in cubic feet or B.Th.U., and a less quantity for household and industrial purposes, coincidently relieving the transport of coal and, to the extent of gas-making use, of coke. We are to-day talking of higher national efficiency and economy; and contribution to it must come from whatsoever quarter it is obtainable.

Reference has been made to the dilution of gas in Germany by simple water gas, owing to the war shortage of coal. It may have escaped the attention of some readers that in the "Journal" for Feb. 27 (p. 395), there appeared some information as to the "Restrictions on Gas Consumption in Germany." In the course of this, reference was made to certain experiences at Düsseldorf. Gas there is debenzolized, and the calorific value is thereby reduced to (say) 508 B.Th.U. To this, some 16 p.ct. of simple water-gas is added, and the calorific value is ordinarily reduced to from 482 to 493 B.Th.U., or a mean of 487 B.Th.U. That is to say, the volume of the debenzolized gas is increased by 16 p.ct. by the addition of the simple water gas, while the calorific power of the whole of the mixture is only lowered by 4·13 p.ct. The debenzolized gas has a calorific power per 100 c.ft. of 50,800 B.Th.U., while the 116 c.ft. of mixed gas has a calorific value of 56,492 B.Th.U., from which it is calculated that the power of the water gas is 356 B.Th.U. per cubic foot. In other words, as nearly 2000 c.ft. of blue water gas are added to the gas production per ton of coal, something like a sixth part of the aggregate consumption of coal must be saved, at a sacrifice of 4·13 p.ct. in the calorific power of the debenzolized gas. The debenzolizing of the coal gas, *plus* the saving effected between the cost of coal and that of coke in normal times, should put B.Th.U. at the disposal of the consumer at a cheaper rate than in ordinary circumstances, besides providing a permanent home market for coke varying only in the quantity absorbed according to the seasonal demand for gas.

There are, however, other considerations bearing on development in this direction. Distribution is not necessarily

one of them; pressure comes to the aid there. There is the question of the lighting-back of burners in apparatus not provided with means of air regulation. Gas fires and lighting burners are usually provided with an adjustment fitting; but cookers and boiling-rings, generally speaking, are not. If we are going to make progress in the direction of supplying as many B.Th.U. as possible for a given sum, the manufacturers of gas-using appliances will have to aid the gas manufacturers by making provision for air adjustment in all appliances—domestic and industrial. There is also the question of power supply. Our electrical friends are not looking with any pleasure upon movements in the direction of cheapening B.Th.U. by the gaseous way. They are put to it badly enough now in regard to all heating operations; and they see the rate of increase of their power load stemmed if a gas of regular composition, purity, and pressure, and not loaded with inert constituents, though of lower calorific value per cubic foot, can be supplied at reduced rates. Bearing upon this is the communication Mr. W. A. Tookey—a well-known gas-engine expert—recently made to the Society of Chemical Industry, particulars from which were published last week. As a student of power supply, he puts at as low as 400 B.Th.U. per cubic foot the limit at which it would pay gas authorities to distribute through their mains. Another interesting point is that, while he finds a difference of 10 to 13 p.ct. between stripped and unstripped gas in the power developed by gas-engines, this is reduced to only 5 p.ct. on adjusting the air supply. No producer-gas plant—especially suction-gas plant—can supply gas of such uniformity of composition, purity, and pressure, as a gas-works, and that uniformity is a prominent consideration in the power economy of a manufactory.

Thus from several quarters one sees the invitation to the gas industry to consider whether, by a step further than that already taken in respect of the grade of gas distributed, national economy and efficiency can be served (1) by saving, through the making of simple water gas, more coal and consequently transport in relation to the business done in gas, (2) by discarding the use of imported oil as far as possible, and (3) by supplying in gaseous form—conditions of use being modified to suit the new circumstances—more B.Th.U. per ton of coal carbonized.

Naphthalene Difficulties: Causes and Cure.

EVERY gas engineer in the United Kingdom should have received before this, from the Institution of Gas Engineers, a copy of a brochure on the, at the present time, very live subject of "Naphthalene Stoppages." In conversation with the Hon. Secretary (Mr. W. E. Price), we learn that it is the earnest desire of the President (Mr. A. E. Broadberry) and the Council that every engineer troubled with naphthalene should read and mark and act upon the information that is succinctly and plainly given in the pamphlet. The Council have recognized that the revival of the trouble with naphthalene, unless firmly handled and minimized, is likely to have, unnecessarily, a retarding effect on the practice of oil and tar washing for the extraction of benzol and toluol from gas, and that this would be a national as well as an industrial disadvantage.

It is only since the beginning of the practice of oil and tar washing of gas that the trouble has again been rife. During the same period, it has projected itself from addresses, papers, and discussions; and there has been shown a not-inconsiderable lack of knowledge, despite the published results of investigations, as to causes and remedies. The effects have been better (and bitterly) known. There is, however, no reason whatever why, if the conditions are all right—if condensation is sufficient in summer to reduce the naphthalene content of the gas, if care is taken in regard to working temperatures and the use of a washing oil not surcharged with naphthalene, if solvent vapours are added to the washed gas in quantity sufficient to compensate for those removed in the process of washing for benzol and toluol, or to maintain the right proportion of solvent vapours in relation to the naphthalene present in the gas—there should not be complete immunity from trouble from deposits on the works and in the distribution system. This, of course, assumes that the works' mains and the distribution system are free from deposits, or have been freed from old deposits, which process sometimes takes a length of time that has disheartened some engineers, but perseverance in which has brought good reward. Upon all these essential matters (as well as upon the solvents to be used, and the point at which to apply them) the brochure supplies information, which, as a circular-letter accompanying it states, "if acted "upon, should lead to the effective prevention of the depo-"sition of solid naphthalene, on the works' plant and in the "mains and service-pipes of the distribution system."

But where some gas managers are at a loss who have not themselves chemical qualification or a chemical assistant, is in ascertaining the condition of their gas in respect of naphthalene and solvent vapour content, and in determining the quantity of the latter to be added. In their case this at present can only be done by working trial; and if this is not on a fairly generous scale in regard to the solvent supplement at the commencement of the work, disappointment with the results may be prolonged beyond what would otherwise be the case. The brochure gives—so much is governed by circumstances—but meagre information on this point. It simply states that the quantity of solvent to be added depends to some extent on the amount of naphthalene in the gas, and on the nature of the solvent, but generally it is found that the addition of from 10 to 15 gallons of solvent per million c.ft. of gas, in addition to that normally present, is quite sufficient to ensure freedom from trouble, provided that the mains and services have not old deposits of naphthalene lying in them. Where the benzene, toluene, &c., have been washed-out of the gas, a slightly larger additional quantity may in some cases be necessary. Another point of importance, of course, is continuous and not intermittent treatment. The latter has in certain cases brought a repetition of difficulty.

Although the naphthalene trouble has assumed greater proportions since the advent of the washing of gas for benzol and toluol, the whole of it must not be laid to the charge of the process. During the same period inferior coal has been supplied, and economy and the maintenance of supply have claimed as large as practicable a production of gas per ton. Again difficulties have arisen through the impossibility of getting executed necessary extensions of condensing plant; and this has in cases resulted in insufficient condensing, and thus in an increase of the amount of naphthalene in the gas. Then the supply and price of oil have compelled a reduction in the quality of carburetted water gas, which has in turn caused a diminution of the solvents in it. These are factors which help, in addition to the oil or tar washing process, to disturb the old balance between the naphthalene and the solvent vapour content of the gas. The "Naphthalene "Stoppages" brochure is a helpful production, and one which is bound to have, if proper attention be paid to it, a large palliating effect upon the present difficulty.

Preservation of the Standard Rate of Dividend.

JUST recently announcements have come to hand of some formidable increases in the price of gas by certain sliding-scale companies, which, added to the previous war increases, make things look extremely ugly for the stockholders, who have to bear the same burdens of the times (heavy income-tax included) as the share and stock holders of other trading concerns which are not bound by the unyielding bonds of a statutory sliding-scale of price and dividend. The sliding-scale as applied in the gas industry is a splendid and effective piece of mechanism for normal working, but not when, as now, extraneous conditions entirely upset the equilibrium of all that is fundamental to maintaining a fair balance of justice between those concerned. From almost the beginning of the war, we have directed attention to this matter; and some time ago the Gas Companies' Protection Association were invited by certain gas undertakings to consider it. But the Committee of the organization, in their wisdom or otherwise, came to the conclusion that there was no call upon them to move, as there was then no general complaint as to the effects of the sliding-scale, and that companies who felt their proprietors were unduly injured, through its operation, should attempt on their own behalf to obtain relief. So the matter has been shelved, until the conditions are such that the dividend upon an important part of the capital invested in sliding-scale gas undertakings is, with the deduction for income-tax, on the high road to vanishing point. This is—more in these times than in any others—a lamentable condition of things for stockholders, from both the income and the market value points of view. If Mr. Charles Carpenter, D.Sc., thought twelve months ago that the sliding-scale was not giving "even justice," we wonder what he would say to the condition in which some gas stockholders will find themselves when they come to receive their dividend warrants

six months hence. It is a pity that an effort was not made earlier to get some scheme adopted which would have established a stopping place in the precipitous decline of dividends—a decline which is becoming ruinous for some proprietors not blessed with several sources of income. The reply will no doubt be that the present position offers a better case than before for asking for relief, to which the retort may be made that precious time has been wasted before bringing the, in commercial experiences, extraordinary condition of things to the notice of the authorities as well as the prospects of still worse (which has now arrived) if the war continued.

It is not surprising, in view of the slender dividends which some stockholders will be receiving at the close of the current six months that the matter is now revived—this time by Mr. A. M. Paddon, in our "Correspondence" columns. He makes certain suggestions in which he steers a middle course, which ought to safisfy those who think the question of relief is not one for general but individual treatment, as well as those who agree (as we do) that in these abnormal times gas proprietors should sacrifice something—but not "something" that leaves only the skeleton of a dividend—as well as the consumers. The suggestions may even unbend those moneyed gas men, with more than one source of income, who have urged that, although unusual circumstances have undermined the whole of the conditions on which it is based, the sliding-scale having been taken for better or for worse (with no thought as to the possibility of anything happening such as has occurred with increasing severity since 1914), should remain immutable. We are not of that opinion, any more than we think that the whole burden of higher war costs of materials and working should be placed upon the consumers, though that is the case with other commodities, *plus* extra profits which call for the imposition of an excess profits tax. Mr. Paddon's suggestion is that relief for gas proprietors should be extended, through the standard price of gas, in measure sufficient to at any rate preserve—we take it for the period of the war, and for a time after—standard dividends. This certainly is not asking too much. The second point of his suggestion is that a Special Committee or other Tribunal should be appointed to consider on its merits the application for relief of each company, and grant it to the extent considered to be appropriate. To carry out the suggestion, the good offices of the Board of Trade would have to be secured. The Board could not act in such a matter without the sanction of Parliament; but if a Standard of Calorific Power Act can be carried through Parliament in a few weeks, so could a Revision of the Sliding-Scale (Gas) Bill. But the parliamentary machinery requires a prime mover. The Gas Companies' Protection Association did not last year care to intrude itself in the matter, Perhaps now the National Gas Council could be brought into action, especially if those gas proprietors with before them the prospect of receiving very lean dividends threw their weight on the side of the advocates of an endeavour being made to secure some just measure of relief.

The Agriculturist and Nitre-Cake.

It is four weeks since we referred to the question of the utilization of nitre-cake in sulphate manufacture, which had been dealt with by Mr. P. Parrish, the Manager of the East Greenwich Chemical Works of the South Metropolitan Gas Company in an able article which he furnished to us for publication as a guide to managers of sulphate plant who were contemplating the employment of nitre-cake [*ante*, pp. 334, 345]. Attention has been again directed to the same matter by Dr. J. A. Voelcker, the distinguished chemist to the Royal Agricultural and Royal Horticultural Societies, in the course of a paper which he read on Wednesday last before the Royal Society of Arts. Though no one is better informed than Dr. Voelcker on matters directly connected with the supply and use of fertilizers, he appears, from the report of his paper which is given on another page of to-day's "Journal," not to have been aware of the efforts which have been made, at the instance of the Ministry of Munitions and the Sulphate of Ammonia Association, to utilize nitre-cake in place of some of the sulphuric acid that is normally required for the manufacture of sulphate of ammonia.

We have, however, in the paper, his assurance that a much lower quality than 24 or 25 per cent. sulphate would do quite well for farmers; and the presence in it of sulphate of soda (derived from the nitre-cake) would not constitute a bar to its employment. Another distinguished agricultural chemist, Dr. Bernard Dyer, in the course of the discussion on the paper, confirmed this view, and referred to early researches which showed that soda salts had a very considerable fertilizing influence on soil. Without wishing to labour this point, which is one of which the Nitrate of Soda Committees will make the most they can, we think it must now be accepted by farmers that an admixture of sulphate of soda with sulphate of ammonia is innocuous, even if not directly beneficial.

The question of the use of nitre-cake in sulphate manufacture therefore now turns on two issues—viz., (1) manufacturing difficulties, and (2) the carriage on and handling of a material which is more bulky than unsophisticated sulphate per unit of nitrogen contained in it. Mr. Parrish has shown that the working difficulties in using nitre-cake to produce sulphate consisting of nine parts of the ammonia to one part of the soda salt, are not serious. As regards the second point, mixed salt of this composition would still be richer in nitrogen than nitrate of soda, and so should be better able to stand transport and handling charges than the latter fertilizer. Consequently it seems that, during the prevailing scarcity of sulphuric acid and abundance of nitre-cake, it would be to the national advantage that nitre-cake should be used as far as is practicable in sulphate manufacture, always provided the British farmer will accept the product at a price, per unit of ammonia present, approximately equal to that fixed for ordinary sulphate at the present time. We hope Dr. Voelcker and Dr. Dyer may be able to convince the farmer that the mixed sulphate will serve his purpose perfectly well; and, if they can do this, we have no doubt that patriotism will impel the larger at least of the producers of sulphate to wrestle with and overcome the difficulties which the use of nitre-cake involves. The prohibition of the export of sulphate has incidentally removed one objection of sulphate manufacturers to producing the mixed salt—viz., that it could not compete in export trade with the normal grade of sulphate made in other countries. If the British farmer is willing for the mixed salt to have a fair trial, makers of sulphate can give individual attention to the utilization of a considerable quantity of nitre-cake, as there is at the moment no export business to be prejudiced.

Reduced and Less Efficient Man Power.

The Sheffield Gas Company appear to have had an exceptionally unpleasant experience last year, due to the great draft upon them for gas for munition purposes, and to the shortage of workers. The increase in consumption was only a small fraction short of 8 p.ct., reduced street and shop lighting and the economizing effects of the Summer Time Act notwithstanding. The Company have also had an unusually unfortunate experience in regard to naphthalene stoppages, which the Chairman (Mr. Wilson Mappin) attributes to the extraction of benzol and toluol from the gas. No doubt this was the main cause; but probably something was also due to the efforts made to meet the demands for gas by producing an increased amount per ton of coal. This is suggested by the fact that the pressure of the gas had also to be lowered; and reduction of pressure would, it may be presumed, in the circumstances of demand, only succeed all efforts to increase the supply of gas per ton of coal handled. But so prone are the public to talk of "bad gas," that the lessening of the pressure and the naphthalene trouble brought upon the Company the favourite descriptive term. Labour was another difficulty; and the experience, not only here but elsewhere, ought to convince the Labour Supply Department of the Ministry of Munitions that, in a specialized industry such as gas supply, the removal of efficient men from certain departments and the supply of substituted labour is not an economical proceeding. Greater man power does not compensate for loss of skill and efficiency in such work; nor does it conduce to the promotion of efficiency in the munitions factories to have the agent from which light, heat, and power are procured interfered with in the manner that has, through such unfortunate circumstances, been experienced in Sheffield.

Income-Tax Receipts.

The portion of most general interest of the fifty-ninth report of the Commissioners of Inland Revenue—covering the twelve

months ended March 31, 1916—will probably be that relating to income-tax. One of the important changes bearing upon the year 1915-16 which were effected by the Finance (No. 2) Act 1915, was that the tax charged on any individual or firm in respect of the profits of trades, professions, and employments, may be paid in two instalments—on or before Jan. 1 and July 1 respectively. For 1915-16, however, it was, it will be remembered, provided that, instead of the tax due being paid in two equal instalments, the first was to consist of the tax payable under the Finance Act, 1915, and the second of the additional tax chargeable under the Finance (No. 2) Act of the same year. This provision had the result of postponing until 1916-17 the collection of a large part of the additional taxation imposed by that Act, which is not, therefore, fully reflected in the receipts for 1915-16. But with or without this qualification, the figures contained in the report are remarkable. The net receipt on account of income-tax in the year 1905-6 was £31,294,752; in 1914-15 it was £59,423,831; and in 1915-16, £112,372,936. The gross amount of income brought under the review of the Department for income-tax purposes in 1905-6 was £925,184,556; and in 1914-15, £1,238,313,397. The figures for 1915-16 are not yet available. In the case of gas-works, the gross amount of income for the year 1914-15 (the assessments are based on the profits of the preceding year), in the United Kingdom, was £9,279,975. Divided up, the amounts were: Metropolis, £2,900,694; total for England, £8,401,849; Scotland, £656,636; Ireland, £221,490.

Tar Investigations.

A good survey was made of the production, distillation, and applications of tar in the paper that Mr. Reginald Cross read recently before the Western Section of the Scottish Junior Gas Association; and it emphasizes many important points. The figures given, the author states, must not be utilized as a guide to practical working, but must be looked upon from a comparative point of view, as only small samples were taken for distillation. But as the same method and the same quantities of tar were used in all cases, the results are extremely useful in pointing out the marked difference that the various methods of carbonization have on the quantity and quality of the tar product. Needless to say, the variation in the coal plays a very important part, but the method of carbonization plays as great a part, if not a greater, in determining the quantity and quality of tar produced. From the figures, it will be seen that a very much better tar is made (save for the purposes of the Explosives Supplies Department of the Ministry of Munitions) in vertical retorts than in horizontals; the greatest difference being in the amount of phenols present. The curious results obtained by adding 10 p.ct. of free carbon to 90 p.ct. of tar are very interesting; and it is certainly worthy of further investigation, especially as the light oils appear to be increased only at the expense of the heavy oils.

Efficiency in Use and Calorific Power.

Our American friends are learning what was found in this country some years ago, that a high calorific power gas may, in comparison with a reasonably lower calorific value one, actually promote inefficiency in the appliances in which the gas is used. Efficiency in these appliances does not advance *pari passu* with the heightening of calorimetric observations; and there is a point, according to the constitution of the gas, at which the efficiency actually begins to descend with the higher calorific values. The United States Bureau of Standards has been making investigation, in connection with the substitution of the calorimeter for the photometer in Chicago, as to the effect in the incandescent burner of various calorific power gases. The general result is to put in favour a lower calorific quality of gas than has hitherto obtained. A difficulty is with incandescent burners to induce users to alter their gas and air adjustments so as to maintain the maximum efficiency; and one of the points that the Bureau of Standards have satisfied themselves upon is that the fluctuations from maximum efficiency with changing conditions are less (despite inattention to adjustment) with a lower grade gas than with a rich one. In other words, the rich gas appears rather more susceptible to variations from maximum efficiency than a lower grade one through alterations of pressure and inattention to air adjustment. It is found, too, that with a rich gas the air-ports must be fully open; and with a poorer calorific gas they must be partly closed. This shows that with the rich gas there is no margin allowed for further air adjustment; while, on the other hand, the partial closing of the air-ports for the poorer gas indicates that there is with this gas a less indrawing of inert constituents to promote a reducing effect on flame temperature. The tendency of a rich gas to blacken mantles is also referred to. Comparing 650 and 565 B.Th.U. gases, it was found that the light per B.Th.U. was slightly in favour of the poorer gas, and the difference is enhanced at the point of maximum candle power. The results of investigation of this kind are enabling those in authority to see that efficiency in use does not proceed to increase with advance in the higher calorific values; and that therefore there is waste in making a gas beyond a given calorific power, according to the composition.

Nitrogen Products from Water Power.

The shareholders of Nitrogen Products and Carbide Company, Ltd., are growing a little more cheerful under the influence of a 3 p.ct. interim dividend and the splendid optimism of their Chairman, Mr. A. E. Barton. The war has been a godsend to the Company; and the Chairman has a bountiful faith that what has happened betokens a remarkable place for the Company in the world's affairs. When there is no war, when submarines cease to worry, when the world sinks back into the process of development in a more or less prosaic way, and when the products of the Company enter into competition with products from other sources—natural and otherwise—serving the same ends, and which do not involve the same huge capital expenditure in harnessing and working with water power, then the position will be one which will enable better judgment to be formed. The Company's water-power rights are computed at about a million horse power; and this the Chairman thinks will all be brought into use within the next ten years in the production of nitrolim for chemical and fertilizing purposes. The whole output of the Odda works for this year—about 70,000 tons—has been disposed of. So insistent has been the demand for chemical purposes that the supply for fertilizing has had to be curtailed. The English factory for the production of nitric acid and nitrate of ammonia by the catalytic process has commenced working. All the great Powers are taking the steps necessary to assure themselves of a supply of nitric acid and nitrate of ammonia independent of the overseas supply of Chili nitrate. The Company's system is much favoured in this connection; and the Chairman takes credit to himself for his recognition of the enormous possibilities of the Ostwald catalytic process. Though not at present in a position to supply any material quantity of cyanamide for agricultural purposes, a great deal of time has been devoted by the Company to the perfecting of their method of manufacturing granular nitrolim; and Mr. Barton believes that, with the large amount of water power at the disposal of the Company, they will be in a unique position to assist not only this country but the whole world by the production of a cheap nitrogenous fertilizer. Confidence in the future has therefore a present generous base. Other producers of nitrogenous fertilizers will watch with interest the actual development as it is unfolded to their gaze, to see how far it harmonizes with the existing belief of Mr. Barton and his colleagues.

Coal and Coke Exports.

As mentioned last month, the Board of Trade are now only issuing summaries of the monthly coal returns. Regarding the February figures, the exports of coal, coke, and patent fuel were 2,902,617 tons, and the value £3,782,536. These figures compare with 3,310,384 tons, valued at £3,363,149, in February, 1916, and 3,784,894 tons, valued at £2,636,845, in February, 1915. There was thus a decline in volume of 407,767 tons, and an increase in value of £419,387, last month compared with the same month of 1916. During the past two months, the exports amounted to 6,391,111 tons, valued at £8,370,763, as compared with 6,693,483 tons, valued at £6,590,399, in the same months of 1916, and 7,554,492 tons, valued at £5,267,107, in the corresponding period of 1915. There was therefore in January and February a decline of 302,372 tons in volume and an increase of £1,780,364 in value, compared with the first two months of 1916.

The Illuminating Engineering Society will meet at the Society of Arts, John Street, Adelphi, on Thursday, when a discussion on "Fluorescence and Phosphorescence and their Use to Produce Luminous Effects" will be opened by Mr. F. Harrison Glew.

NAPHTHALENE STOPPAGES.

The fact that during recent years, and more particularly since the introduction of processes for the extraction of benzol and toluol from coal gas, stoppages in plant, mains, and service-pipes caused by naphthalene have increased considerably, led the Institution of Gas Engineers to refer the matter to a Special Committee for consideration. As an outcome, a *brochure* has been prepared with the object of summarizing the results of investigations and research on the subject and the methods which have been found effective in obviating such trouble from naphthalene stoppages, and disseminating information which (if acted upon) should lead to the prevention of the deposition of solid naphthalene, both on the works' plant and in the mains and service-pipes of the distribution system. In forwarding a copy to the "Journal," Mr. Walter T. Dunn (the Secretary of the Institution) states that the *brochure* has been issued to the engineer of every gas undertaking in the United Kingdom.

The subject-matter ensures for it the careful attention of all recipients—the more so as the manner in which it has been drafted is both brief and to the point, as becomes the strenuous times in which the gas manager now lives. An allusion to the general conclusions arrived at from the well-known investigation carried out some years ago by the Southern District Association of Gas Engineers and Managers, leads up to the statement that the practical steps to be taken for obviating the naphthalene trouble are: (1) In the works, to arrange to reduce the amount of naphthalene left in the gas to the lowest practicable limit. (2) Addition to the gas before leaving the works of such sufficient amount of suitable solvent vapours as will ensure that any naphthalene remaining in the gas will not separate in the solid state during its subsequent distribution.

On the first point, attention is drawn to the lack of sufficient condensing power for summer conditions, as not only causing the retention of a much larger amount of naphthalene in the gas, but as also having a very prejudicial effect on the complete recovery of the ammonia. But it is added that, though by efficient condensation it is quite practicable to very considerably reduce the amount of naphthalene left in the gas, it is not possible by this means alone to obtain a gas which will be safe from subsequent naphthalene deposition—when such gas is produced in horizontal or inclined retorts, and with a make per ton such as is now commonly attained. In most cases, at any rate, with adequate cooling, gas from vertical retorts gives no trouble from naphthalene deposition, unless the vapours are subsequently extracted. As for the gas from horizontal or inclined retorts, a further reduction in the naphthalene is often effected by washing the gas, after condensation, with oils capable of absorbing naphthalene—such as green oil mixed with 3 to 5 p.ct. of benzene, with paraffin oil, with light coal tar oils, or with carburetted water-gas tar. With the last two materials the effect is a double one—some naphthalene being removed from the gas, and some additional quantities of naphtha vapours from the oil or tar being taken up by it. In some instances, the washing with carburetted water-gas tar is carried out on the hot gas before condensation, and in others on the cooled gas after condensation; and in both cases it has a beneficial effect, if the tar has a low naphthalene content and a high naphtha content. Owing, however, to the lower quality of carburetted water gas now being generally manufactured, the tar frequently contains more naphthalene and less naphthas than previously, which makes it less effective; and there is also a tendency for an increasing amount of naphthalene to be present in the crude light coal-tar oils supplied. Whereas for the purpose required the tar oil should not contain more than about 5 p.ct. of naphthalene, that applied has, it seems, sometimes been found to contain as much as 20 p.ct.

With regard to increasing the solvent vapour content of gas before distribution, it is remarked that during the past few years a number of different liquids have been used for the purpose of augmenting the quantities of solvents in the gas at many works with a large degree of success. Of the various solvents—apart from questions of price and of ease of obtaining them, and of their naphthalene content—it is probable that those derived from coal tar or carburetted water-gas tar are the most efficient for a given quantity, by reason of the fact that their capacity for dissolving naphthalene is the highest. In the case of condensed liquid obtained by the compression of oil gas, the quantity required is much greater, on account of its large content of crude benzene and toluene. But these have the additional value of acting as enrichers. Paraffin oil, though only capable of dissolving a lower percentage of naphthalene than coal-tar naphthas, has the advantages that it is always entirely free from naphthalene and can under ordinary conditions be obtained without difficulty. Paraffin oil must be introduced in the form of a "mist" or "fog," in such a fine state of division that the particles are carried mechanically with the gas to the extremes of the district of supply; and then this oil is successful in eliminating naphthalene trouble. The most suitable kind for the purpose is a light paraffin oil, such as white spirit, as this has a lower average boiling-point, and a greater proportion of it is taken up as true vapour by the gas.

Reference is next made in the *brochure* to the marked increase in naphthalene complaints since the war; and the causes of the increase are briefly explained. Emphasis is laid on the fact that the extraction of benzene and toluene, whether by tar-washing or oil-washing, though it may, and frequently does, reduce the amount of naphthalene in the gas, reduces in still greater proportion the quantity of solvents remaining, which makes the gas more liable than before to deposit naphthalene, in spite of the smaller quantity present. Further, if the gas is not properly cooled before the oil or tar washing, or if the oil or tar is too warm, the quantity of naphthalene in the gas may be considerably increased, owing to naphthalene being taken up from the tar or oil used. The quantity of solvent which must be added for complete prevention depends to some extent on the amount of naphthalene in the gas and on the nature of the solvent; but generally it is found that the addition of a quantity of solvent of from 10 to 15 gallons per million cubic feet, in addition to that normally present, is sufficient to ensure freedom from trouble—provided that the mains and services have not any old deposits of naphthalene lying in them. Where the benzene, toluene, &c., have been washed out of the gas, a slightly higher additional quantity may in some cases be necessary. Engineers are warned that to cease adding solvent when there is no trouble in the district, is in the long run false economy. When trouble is experienced owing to the picking-up of naphthalene from old deposits, appreciable relief (though not complete cessation) is obtained by considerably increasing for a time the quantity of naphtha vapours added to the gas; and where the trouble is bad in one particular district, much relief has been obtained in some instances by locally spraying or evaporating naphtha into the mains.

A description is then given of the two methods of adding solvents to the gas—by spraying and by evaporation; and finally consideration is given to the point at which the addition of solvents is best effected. The addition may be made either between the station-meter and the holder or to the gas as it goes out to the district. Both methods, it is said, are in successful use in practice; and no definite evidence is available as to which of the two plans is the better. It appears probable, however, that where the mains are free from old deposits of naphthalene, the treatment of the gas at the holder inlet is on the whole preferable, but that where such deposits still exist these are more rapidly got rid of if the treatment takes place on the gas immediately before it is sent out into the district.

ELECTRICITY SUPPLY MEMORANDA.

In one or two unsavoury cases recently, the word "maintenance" has been prominent, and in one of them damages are claimed for the alleged act of paying-out money for the "maintenance" of a previous action. Despite these illustrations, the Hackney Borough Council continue to strain hard against the strong resistance of other local authorities to take a financial part in supporting litigation as against the Gas Light and Coke Company, who are moving the Courts to declare that the Hackney Council are guilty of showing undue preference in respect of certain charges for electricity supply. In this connection more than one solicitation to local authorities has emanated from Hackney; but, in the latest letter, the Borough Council show exactly how wide their mouth is open, and how much they expect other local authorities to put into it. According to the "Electrical Times," the letter "regrets that, in view of the fact that the point raised by the Gas Company is of extreme importance to all municipalities possessing electricity undertakings, a combined effort should be made to maintain the position and to defeat the contention of the Gas Company, and that, with this end in view, such authorities should consent to make a contribution towards the expenses of fighting the action on the basis of revenue at the rate of £1 for every £1000 or part thereof of gross revenue of their undertakings, computed from the return for the year 1915—the maximum from any undertaking to be £100 and the minimum £5." Does it depend upon the "combined effort," or upon the law, that the contention of the Gas Company will be defeated—that is to say, if it is not upheld? However, certain local authorities refuse to permit the Hackney Council to assess the size of their contribution to this maintenance-of-litigation scheme. The East Ham Electricity Committee decline to contribute on the basis named, but have voted 20 guineas to the purpose; but the Council has referred the matter back. The Hull Corporation will not subscribe more than the £5 they had promised. The Stretford Electrical Committee wants to make a contribution; but wisely first prefers the sanction of the Local Government Board. The Chester Electricity Committee suggests a contribution of £15. The Cardiff Electricity Committee proposes a contribution of £1 for every £1000 (or part thereof) of gross revenue in 1915. This, it is stated, will mean a maximum of £68. The Hampstead Electricity Committee has secured the endorsement of the Borough Council to a contribution of ten guineas.

Hackney's Mouth Still Receptive.

War Losses, and a Cool Suggestion.

Talking of preference, why should municipal electricity undertakings have preferential treatment in these, or for the matter of that in any other, times? Every individual has to bear the additional charges that fall upon him through war-time circumstances; and every privately-owned gas, electricity, water, or any other concern has to order its business so that outgoings are met by revenue, despite the swollen character

of those outgoings. Otherwise, it simply means, providing that there are no reserves available to help, that the high road to bankruptcy has been entered upon. A correspondent of the "Electrical Review," signing himself "Quiz," asks, in view of the heavy deficits shown by "numerous" small municipal and urban council undertakings which are situated outside industrial centres, what steps are being taken in order to cope with the melancholy prospect before them? The engineers of these small stations are uncertain on the point as to how much of the estimated loss ought to be directly provided by the consumer, and what proportion (if any) by a call upon the local rates? Then "Quiz" goes on to argue in this fashion: "While, of course, it is only fair that the consumer in these days of abnormal prices should pay a fair price for his current, it is obvious that to ask him to provide for such extra revenue as would completely cover the estimated loss would, in the long run, do the undertaking more harm than good." Supposing the administrators of other classes of business contended in the same imbecile way, what would become of them? In most of the towns in which these small and unprofitable electricity stations are to be found, there are gas undertakings run by private enterprise; and they have unaided to face the same conditions as the electricity concerns. Why, then, should the electricity undertakings have preferential treatment, simply because they are under municipal management? Why, too, should the municipal electricity concern in one town have preferential treatment over the one privately owned in the neighbouring town? If local authority ownership of a trading undertaking is to justify itself, it must do equally as well as, if not better than, private control, and without external aid. There is no proportion of the loss incurred by the municipal electricity undertaking that can justly be drawn from the customers of a competing private undertaking, or from ratepayers who are not electricity consumers. People only talk as "Quiz" does because the local authority has some power of compulsion in this matter—a power not possessed by other traders. The conferring of this power was one of the greatest mistakes made by the Legislature; and municipal gas consumers have had to pay, and dearly, the penalty of the mistake through the accompanying power which enables the authority, conditions permitting, to make from the consumers huge profits in aid of the rates. We are not believers in the one power or the other. The proper thing is that there should be repayment to the ratepayers of any assistance rendered by them to an undertaking, and nothing more—the profits beyond should be devoted to the improvement of the service to the consumers and to the financial strengthening of the concern.

False Economy and Public Safety.

The operation of the Summer Time Act does not make the hours of darkness any the less during the twenty-four. It only adds one hour of light to the active part of the day, and extends the dark sleeping hours by one—that is, if the spirit and intention of the Act are complied with. According to the "Electrical Review," the Deptford Borough Council are urging that, "considering the brief period of darkness during the months of May, June, July, and August resulting from the adoption of the Daylight Saving scheme, it is desirable to dispense with street lighting during those months." The Council see in this a means of saving fuel and labour. The Summer Time Act has not made the period of darkness any less than before; but it evidently supplies the Council with an excuse for doing something that may turn out to be false economy. The Home Office Committee who investigated the question of the summer-time experiences last year through the alteration of time, stated that the additional hour of daylight thrown into the active part of the day was found advantageous by the police. We can hardly imagine that the police will find it conducive to the proper performance of their duties in Deptford to be deprived of artificial lighting during four months of the year.

Attention Required by the Electric Meter.

The constitutional frailties of electric-meters are well known. The Board of Trade may approve of certain types; but we are cognizant of the excellent ground there is for the articles occasionally found in technical electrical contemporaries treating of the errors of such instruments of torture to electricity consumers, and for the advice that electric meters should be pretty frequently tested. Mr. J. Rennie, in an address before the Association of Supervising Electricians urged short-period testing. As a beginning, he thinks the interval should not exceed three years, and preferably one year. Five years should be the maximum. But he goes on to question the real economic advantage of electric-meters. He thinks there must be something like three-quarters of a million such meters in use, which, at only 30s. each, would represent a capital expenditure of £1,125,000. In his opinion, probably four or five years represents the accurate life of a meter; and it might be estimated that renewal would be necessary at the end of ten years. A moderate estimate for depreciation would be £110,000. To maintain the accuracy of the meter, "extensive" repairs and adjustments would be necessary at the end of every third or fourth year. From these various considerations, it appears to Mr. Rennie, that for all accounts of less than £10 per annum the interposition of a meter adds about 2½ p.ct. to the bill; and "for economy's sake, there is much to be said in favour of dispensing with the meter." From all this further confirmation is obtained of the troublesome character of the electric meter, and of the fact that it is so sensitive and frail that it needs a considerable amount of tender nursing. But its frailties do not justify its abolition, if business is to be conducted on sound lines. There is no similarity between the supply of water and electricity; and practices in relation to the former cannot be advanced as justifying the application of the same methods to the latter.

Technical Development of Electricity Generation.

Mr. W. B. Woodhouse, the Engineer of the Yorkshire Electric Power Company, is friendly towards the gas industry, and an enemy of domestic grates. He looks upon the gas industry (so it is gathered from a report in the "Yorkshire Observer") as an ally of the electricity industry in attempting to supersede wasteful domestic grates. This is very kind; but the gas industry was upon the work of supersession long before Mr. Woodhouse came to the conclusion that the domestic grate was the creation of a barbarous age. While, too, the electricity industry has done relatively little to bring into use a smokeless method of heating, the gas industry has done a great deal. However, Mr. Woodhouse does not think the combined efforts of the gas and electricity industries are going to complete the necessary transformation for some years. But he trots out the scheme whereby his Company will purchase gas for generating purposes from the Barnsley Smokeless Fuel Company—one of the Coalite progeny. But we may point out to Mr. Woodhouse that if people are prepared to pay the price for the fuel produced by the Barnsley Company—fuel containing a comparatively low percentage of volatile matter—it will be a competitor of electricity for heating purposes, and the purchase of the gas will facilitate the marketing of the coke at a more reasonable price than would otherwise be possible. However, it is felt that the electrical industry will have to enter into the bye-product trade from one direction or another. Some writers on this subject (the hare-brained ones, and not the Woodhouses of the electrical industry) refer to this matter as though the gas industry was not already there, and as though they had only to make up their minds that the electricity industry should become large gas and large product makers—the gas for utilization in engines or under boilers for generating purposes—and the thing would be done. We are not quite clear as to how the gas industry is to be disposed of, as that is a much-neglected detail in the great programme. But it is understood that it is to go—in electrical imagination, if not in actuality.

Board of Trade and Interlinking.

The Lancashire and Cheshire electricity supply interlinking schemes are still in the embryo stage. There has been a conference in regard to them in Manchester between the representatives of the undertakings concerned and Mr. G. H. Roberts, the Parliamentary Secretary to the Board of Trade. But it seems fairly clear that, though the Board advised interlinking of electrical undertakings as a means of fuel and labour economizing during the war, they are staggered over the gigantic nature of the expenditure that the experts now tell them would be involved, and that the projects will get pushed over to the other side at the proclamation of peace. It is hardly likely that, in present conditions as to materials and labour, much could be beneficially done during the war period; but there are some electricians who would like to see interlinking an accomplished fact. A like view as to the present attitude of the Board is taken by the "Electrical Times." It says: "The general impression that one obtains from the meeting is that while the various undertakings are enthusiastic for the collaboration and linking-up, several even talking about 'next winter,' Mr. Roberts, of the Board of Trade, did not disclose any anxiety on the part of the Government to precipitate action.

Electric Train Fires.

The humorist of "The Round Table" in the "Electrician" reproduces without comment, but with the introductory words, "Thus does the 'GAS JOURNAL' confuse issues, and take a delight in so doing," the paragraph sideheaded "Train Fires and Electricity," which appeared in the "Memoranda" for Feb. 27. A correspondent has since called our attention to the absurd little dig in our electrical contemporary in this communication: "With reference to your notice of an electric train on fire near Earlsfield station, a short time ago a train in Victoria Station was about to start for the Crystal Palace when dense smoke issued from a guard's compartment, and there was a strong smell of burning indiarubber. The train was densely crowded with passengers, as it was after office time; and they had to be unloaded and packed into another train. Will the wag writing in the electrical paper explain the difference between being roasted alive by 'tricity' and by gas?" The "wag" apparently does not appreciate a distinct difference between electricity and gas in this matter of train fires—a difference that weighs heavily against the former. There is no case on record where gas has been the cause of a railway accident. If—let us repeat the "if"—high-pressure gas instantaneously rushing from a fractured cylinder has ever contributed to a fire on a train, it has always been preceded by an accident not of its making; and it has needed some means of ignition. But here we have instances of trains in which the initial cause of the outbreak of fire is electricity; and on the Continent and in America there have been experiences on the

subterranean railways of a nature which even the Editor of "The Round Table" in our technical contemporary would hardly have the conscience to subject to treatment in his usual flippant vein. There have also been stoppages in tunnels in the Metropolis that have been uncomfortable experiences for the caged-in passengers. There have been disastrous mine explosions that have been traced to electricity; and——but these things are all quite well known at "The Round Table." In all of them electricity has been the primary cause of the trouble. There is no "confusion of issues" in these happenings.

Bar Electric Fires.

The old fallacy as to electric radiators having an efficiency of 100 p.ct. still survives in word, if not in thought, among salesmen of such appliances. The users do not know anything about efficiencies. They judge efficiency by the warmth they enjoy from their heating arrangements on the coldest of days, and by the amount of the account they have to foot. The bar type of fire, as readers are aware, is the latest in the electric heating line. In the "Electrical Review" a writer, signing himself "Experiment," dismisses the 100 p.ct. theory, and sets himself to show that the new fires have their good and their bad representatives in the matter of heating efficiency. He thinks the explanation of the diversity of result may be largely found in the fact that in some instances the wire spirals have close setting on to the fireclay bars, while in others there is some space between, which allows air to circulate between the wires and the fireclay, so absorbing heat from the former and keeping the latter cool. On the other hand, when the wire is in contact with the fireclay, heat is absorbed by it from the wire, and so the radiating surface is increased. This sounds plausible enough. But there must be withdrawal of heat by conduction along the solid fire bar, which will not, therefore, have emission as radiant heat from the front surface. The radiating efficiency of the wires, too, must be impaired by the soaking-up of heat by the bar. We have also heard of some form of chemical action proceeding between the clay bar and the wires, which causes corrosive action on the latter, and does not tend to improve their pristine heating duty. The deterioration that goes on is of an appreciable order, which users are not slow to recognize. Probably the makers are wiser than "Experiment" gives them credit for in keeping the spirals spaced away from the bar. His suggestion is that they should be arranged horizontally in deep grooves in the fire-clay base; but, the wires being embedded in deep grooves, there would be little radiation going to the sides of the rooms—it would practically all be concentrated directly in front. However, the proposer of the improvement says that as both bars and wires would be red hot, it is probable that a radiator of this design would give up 50 p.ct. more warmth to anyone standing in front of it, which shows how poor the old types were—in the opinion of this electrical "Experimenter," who does not seem to have carried out his investigations upon scientific lines.

PERSONAL.

Members of the Institution of Gas Engineers will learn with regret that their popular Secretary, Mr. Walter T. Dunn, is away from the office indisposed. He was in danger of having a serious nervous breakdown; and his doctor advised him to have a month's complete rest. He is now away in Dorsetshire, whence we hope, as will his numerous friends, that he will return with health fully re-established. Miss Dunn, who has shown herself a capable assistant to her father during these times of war and stress, has (under the supervision of the Hon. Secretary, Mr. W. E. Price) undertaken the secretarial duties.

A Commission as Temporary Second-Lieutenant (on probation) has been granted to Cadet H. D. Hazell, the son of Mr. T. H. Hazell, Secretary of the Newport (Mon.) Gas Company. Lieutenant Hazell served his articles with Alderman Thomas Canning, the Engineer, and became Distribution Engineer under the Company. Joining the Royal Engineers Corps as a private in March, 1916, he served at Chatham and Llandudno, becoming Lance-Corporal in September last. He was later attached to a cadet training class at Chatham, and, on passing his examination, obtained his Commission, and is now stationed at Aldershot.

Mr. Robert Hunter, cashier and head of the clerical staff at the Airdrie Corporation Gas-Works, has been appointed to a similar position with the Newark Gas Company, and takes up his new duties this week. He has been presented with a handsome inlaid Sheraton clock, as a parting gift from the staff at Airdrie; Mr. J. W. M'Lusky (the Engineer and Manager) making the presentation on behalf of the staff and employees, and expressing their good wishes for Mr. Hunter's success in his new sphere. Mr. Gillespie, who would have succeeded Mr. Hunter at Airdrie, is now serving with the R.F.A.; but the position is being kept open for his return.

Obituary.—The death is announced of Mr. Francis H. Porter, of Leicester, who, at the time of his retirement a few months ago, was the Senior Representative of the Davis Gas-Stove Company. He was a member of the Murdoch Lodge of Freemasons.

SIXTY YEARS AGO.

From the "Journal" for March, 1857.

Competition in Gas Supply.—Sunderland and Stockton-on-Tees are on the point of disappearing from the list of towns constantly referred to by the advocates of free trade in gas, as evidence of the benefit resulting to the public from unlimited competition. The active opposition which has for some time been carried on between the rival companies in these towns, and which at one time forced down the price of gas to 3s. per 1000 c.ft., is at an end, and with the approbation of the local authorities and consumers generally, powers are taken in Bills now before Parliament to raise the price to 4s. per 1000 c.ft. in Sunderland, and to 5s. 6d. in Stockton-on-Tees. Whitehaven, we believe, alone remains upon the list of places where hostilities are still carried on; but, judging from experience elsewhere, it can only be a question of time as to when both parties shall become weary of their ruinous and senseless warfare.

"Blue Billy" as a Nuisance.—The indictment for a misdemeanour against the London Gas Company, or rather against the Directors and some of the servants of the Company, came to its inevitable termination, at Kingston, when the Chairman, Engineer, and one of the workmen entered into recognisances, in the name of the Company, to appear in due course at the Queen's Bench, and give a guarantee for the abatement of the nuisance which formed the ground of objection. It is unnecessary to recapitulate the particulars of the offence in this instance. Suffice it to say that one of the servants of the Company had polluted that crystal current—called the Thames—with the well-known fluid designated "Blue Billy." We are very far indeed from wishing to defend an action of this kind, more particularly as the production of this "Blue Billy" is really a needless operation at the present day, when the employment of oxide of iron in one or the other form is open to the whole world. But it must be remembered that the London Gas Company is the very Company which has contended for the right of using oxide of iron, and is now in a kind of transition state with reference to the introduction of a new system of purification. Without, therefore, pretending to offer a defence of that which even the Directors themselves condemned, there was room for some allowance on the part of the persons to whom the painful duty of prosecution devolved; and it would have afforded us pleasure to have been able to record that considerations of that kind had gone hand in hand with the legal movements of the prosecution. Such, however, has not been the case; and we are, on the contrary, compelled to testify to the superfluous expenditure of the Company's money, brought about by ringing the changes on every forensic luxury in the catalogue of "taxed costs" and individual annoyance.

Murdoch Lodge, No. 3480.

The annual festival of the lodge was held last Thursday at the Imperial Hotel, Birmingham, when the Acting Master, W. Bro. S. O. Stephenson, P.P.G.A.S., Worcestershire, was the Installing Master—a position that would have been filled by W. Bro. Captain Thornton, who was installed twelve months ago, but unfortunately was killed soon after his return to military duties in France. This year's W.M. is W. Bro. Harold George Eveson, and his installation was impressively rendered by Bro. Stephenson. The other brethren invested were:

Wor. Bro.	Luke B. Taylor	S. W.
"	W. J. Rendell Baker.	J. W.
" "	Alfred T. Harris	Chaplain.
" "	Fred Vale	Treasurer.
"	Frank Jervis	Secretary.
" "	Vincent Hughes	Charity Steward.
"	H. J. Woodfine	S. D.
"	C. H. Webb	J. D.
" "	T. E. Vale	Director Ceremonies.
" "	W. A. Sapey	Assist. Dir. Ceremonies.
"	H. V. Stanton	Organist.
"	Lieut. Robert Scott	Asst. Secretary.
"	W. M. Valon	I. G.
"	Forrester Clayton	Stewards.
"	Major W. R. Glover.	
" "	P. B. Rider	
"	P. C. Mawbey	

Domestic Fuel from Retort Carbon.—The Los Angeles Gas and Electric Company are said to produce a domestic fuel from retort carbon. A kind of brick press is used; and the briquettes are made without any binding material, as attempts to use a binder have not proved entirely successful.

"Professorial Prognostications."—In proposing a vote of thanks to the President at the meeting of the Southern District Association, as reported last week, Mr. James Paterson referred to "professorial" prognostications. Our printers misread the adjective for "professional," and thus modified its intended direct application. We have no doubt that Mr. Paterson had in mind Prof. H. E. Armstrong. If so, the word "professional," though not so good in the particular connection, is not altogether a misapplication. We take it that a man who practises prophecy is a "professional;" and Prof. Armstrong has often enough now foretold the lugubrious destiny of the gas industry, if it does not mend its ways according to his prescription.

CORPORATION AND GAS COMPANY ENGINEERS: THEIR POSITIONS CONTRASTED.

By "Lumen."

In a leaderette in a recent issue of the "Journal," the position of a corporation gas engineer is contrasted with that of a company gas engineer, and the opinion is given that the latter has the happier lot.

"Honesty is the best policy; I have tried both and I know," once observed a wit. The writer has been in the employ of two corporations and two companies; and he knows from his own experience, and that of those with whom he has come in contact, that the view expressed in the leaderette, speaking broadly, is a true one. It is difficult to see how it could be otherwise. A gas committee is composed of men who are constantly changing. They have no money invested in the undertaking they manage; and therefore they have not that keen interest in its success as have directors. Their motives in entering the town council are usually mixed. Some have a genuine desire to spend their leisure time in benefiting their fellow-townsmen; and they try their best to act on the highest principles. But they owe their position on the council to the electors; and there are electors who never allow their representative to forget this fact. They are approached by men with grievances; and it is more than possible that some of their grievances may have relation to the gas engineer. The councillor listens to a one-sided statement, and, if he is on the gas committee, he either seeks a personal interview with the engineer (which is the better way), or else brings the complaint before the notice of the committee without first of all informing the engineer that he intended to do so. If he is not on the committee, he may report the matter to the chairman of it. Now the chairman may or may not be on good terms with the engineer. If he is not, he makes the most of the complaint, and indicates pretty forcibly his disapproval of the engineer's conduct. The latter may take it "lying down," or, if he is conscious that he has done nothing of which he need be ashamed, he defends himself with spirit. This incenses the chairman (who is often the most pushful and self-opinionated man on the committee), and the relationship between the two is not improved.

Though some seek a seat on the council from high-minded motives, there are many who do so because it improves their social position or business, or both, and brings in their way banquets, outings, deputations, and other privileges which appeal to a certain order of mind. These men are also pushful. They have succeeded in making money (the sole test of merit and ability!) by mastering the great difficulties and technicalities of, it may be, a butchery business; and they are of opinion that the qualifications required in a gas engineer and manager are not greater than, if indeed they are as great as, those which they themselves possess. These are the men who wax so eloquent when the question of an increase in the engineer's salary is brought forward, and who risk an apoplectic seizure, so great is their wrath, when a bonus to that official for extra or special work is proposed.

By dint of the exercise of tact and conciliatoriness worthy of a successful diplomatist, an engineer may succeed in winning the good opinion of the mixed body of men who form his committee; and, if he is content to work on from year to year without ever suggesting that he is entitled to an augmentation of salary, he may live a comparatively happy life. But let him venture to hint at a "rise"! If he is past middle-age, the idea rarely gets beyond the chairman. If it does, how the flood-gates of eloquence are opened! What difficulty the chairman has to prevent more than one from speaking at the same time! Councillors, who maintain habitual silence when technical and financial subjects are brought forward, suddenly become animated and talkative. The unhappy engineer, banished for the time being to an adjoining room, paces up and down, wondering when the interminable argument will come to an end, and vowing that never again will he bring such misery upon himself. At length, he is called back, and informed of the result of the wrangle. As likely as not, the decision has gone against him; perhaps it has gone in his favour, but to so limited an extent as to be almost worthless; or he has obtained what he desired by a majority of one. The voting discloses the men who regard him as well paid for his work, and for a long time to come he doubts (if he is a sensitive man) whether he was wise to "go in" for the increase at all. *Experientia docet.* He becomes a philosopher. Life has its compensations!

Fortunately, however, in this regard, a few years sees an almost entire change in the *personnel* of the committee; and his awful presumption and self-conceit are buried in oblivion. In his novel, "Resurrection," Tolstoy, referring to officials, says: "They are just officials, only troubled about pay-day. They get their salaries and want more; and there their principles end." There are a great many councillors who agree with the great Russian in this, if in no other, respect. If the engineer should be a young man with a spark of ambition in him, he keeps a vigilant eye on the advertisement columns of the "Journal," and transfers his services to a gas company at the earliest possible opportunity.

And yet, if gas committees would only have the sense to realize it, a highly competent and monetarily-satisfied engineer is an investment which yields high dividends. The writer makes bold to say that it is even more necessary that a corporation gas engineer should be a thoroughly qualified man than it is that his brother in company service should be. It is not by any means a general rule that directors of gas companies are technically or commercially equipped to render good service; but it may be said that their qualifications, on the average, are of a higher order than those of a gas committee man. The chairman, at all events, is usually a man of ability. The directors meet oftener than gas committees. Then there is a continuity of service, and a resulting knowledge of the business, which are denied to councillors; and they, therefore, become better able to criticize proposals made by the engineer.

A corporation engineer, on the other hand, does more on his own responsibllity; and the proposals which he brings forward that are beyond the ken of his committee—engineering and scientific questions involving in many cases the expenditure of large sums of money—are usually passed with but little, if any, comment or intelligent discussion. To speak on these subjects would but display a profundity of ignorance. Engineers, with an eye to a change, and with the object of gaining experience of new plant, &c., have been known to take advantage of this lack of informed criticism—often leaving to their unfortunate successors a burden in the shape of capital expenditure under which the undertaking labours for years. Hence the need for a conscientious and highly capable chief officer. Directors know how very largely the success of the company depends upon the initiative, experience, and judgment of the engineer; and, if they have a good man, they have the practical wisdom to appreciate him, both by word of mouth, and by the more tangible tokens of "rises" and bonuses. And these things are usually done with delicacy. No application, no long wrangle, no protracted nervous tension in an adjoining room, but quickly and usually unanimously. Again, a corporation gas engineer has to re-make his reputation as fresh members come to his committee-room. A company engineer's reputation is one of steady and continuous growth; for a new director is somewhat of the nature of a *rara avis*.

It should be said, in conclusion, that the author has not the least wish to disparage the services of the better-class town councillor (often rendered at considerable personal sacrifice), nor to make sweeping generalizations which would be unfair to those who generously recognize ability in corporation officers, and do what they can to reward them adequately. It is not their fault that they have not had a technical training; and if, in spite of good intentions, they bring a limited vision to bear upon the question of emoluments, their upbringing and environment, and not their nature, may be chiefly to blame.

LESSING'S APPARATUS FOR THE EXTRACTION OF VAPOROUS CONSTITUENTS FROM GASES.

[Communicated.]

The device described and shown in the "Journal" for the 20th ult. (p. 347), commends itself for practical use in connection with gas-works and coke-ovens in several respects. It is self-contained, requires no supply of extraneous chemicals, or no transferring of liquids or rinsing-out of utensils—which are a fruitful source of error when minute quantities are in question—no weighing in the balances, of which the same might be said, and generally no manipulation outside the capabilities of that very indefinite qualification usually described as "ordinary intelligence." With the exception of the receiving separator, the whole is constructed in metal, with no delicate parts, and can be carried about the premises or used in any convenient corner that is sheltered from the weather. It is a great advance on the series of wash-bottles usually employed, which include the use of a large quantity of absorbent, the transference of liquids and the rinsing-out of several bottles, and a subsequent treatment requiring the use of a laboratory and special distilling apparatus, which is not available in the smaller class of gas-works. The economy of labour and attention is also a somewhat important matter in these days of depleted staffs.

For the reasons indicated, many gas engineers have been working much in the dark as to their status in regard to the extraction of munition material; and the lack of a convenient method of testing, such as is now supplied by Dr. Lessing, is one explanation of the slackness recently complained of in the adoption of oil-washing. There is also a disposition to regard the "C" process as a convenient compromise or half-way house between munitions and the gas consumers. It has received official approval as assisting in providing the material required by the Ministry of Munitions, and at the same time does not strip the gas below a limit that will pass muster, with the aid perhaps of a little patriotic flavouring, when used in a flat-flame burner. Another point is that the extraction of war material is not a paying proposition in small gas-works, and that many larger undertakings barely secure a return of the extra expenses necessitated by it. Looking at this fact, one reads with surprise that American gas undertakings are making large war profits, as much as 2d. per 1000 c.ft. of gas, or securing twelvemonth contracts that yield a profit sufficient to cover the initial outlay. In England, gas undertakings have been willing to provide munition material at a loss; but with the enormous increase in every item of expenditure, in respect to some of which they have reasonable ground for complaint against the Government, there are strict limitations to their

capabilities. It is all very well for people who do not understand the position to preach patriotism, or to shelve the question by the assertion that "we must all expect to lose in war time," or that "things cannot be expected to go on as in normal times." The price of gas is in some cases getting uncomfortably close up to the parliamentary maximum; and reductions in the rate of dividend are a serious inconvenience to the small investors, who in actual fact represent, to a great extent, the opulent millionaire so frequently presented in theory, to whom the gas dividends are a superfluity that he scarcely knows what to do with.

But all this by the way. If Dr. Lessing's apparatus is put on the market at a moderate price, even the smallest gas manager will have an opportunity of ascertaining how he stands in respect to the extraction of war material, and the comparative efficiency of the "C" process as commonly in use. In this connection a smaller size than is illustrated in the paper might be acceptable, which is suited to the treatment of 5 c.ft. of gas per hour, and yields 100 to 200 cc. of distillate per 100 c.ft. of gas passed. A set taking 2 c.ft. per hour would in twenty hours give 40 to 80 cc. of liquid—sufficient to admit of measurement to within 1 p.ct., which would be quite near enough for practical requirements.

The above article was submitted (in proof) to Dr. Lessing, who informs us that the capacity of his apparatus for dealing with 5 c.ft. of gas per hour was chosen in order to obtain more than 100 cc. of extract, which is the minimum quantity that can be conveniently analyzed by fractional distillation. By reducing the rate of gas, this amount could not be obtained in the space of twenty-four hours; and the rate of gas would be insufficient for ascertaining the illuminating power or the calorific value of the stripped gas. The saving in cost of a smaller apparatus would probably be insignificant, as the same number of fittings, and practically the same amount of work, would be required in making the apparatus.—Ed. "G.J."

COMMERCIAL VALUE OF DIFFERENT QUALITIES OF GAS FOR MANTLE LIGHTING.

In view of the proposed substitution of the calorimeter for the photometer as a means of officially testing the quality of the gas supplied in Chicago, and a re-adjustment of prices, the United States Bureau of Standards was requested to report as to the practical value to the consumer of varying qualities of gas. Laboratory tests have been conducted, not only on high-grade mantle lamps but also on the cheaper varieties in common use, with gases of various qualities as indicated by the photometer, and corresponding in composition to coal and to water gas respectively. There has also been carried out a house-to-house inspection of mantle lights in everyday use, covering over 3000 lamps in ten different towns, supplied with gas of 22 c.p. downwards. The general trend of their results is in favour of poorer quality gas.

As the incandescent light is in no sense dependent upon candle power, seeing that a properly adjusted flame is non-luminous, but the calorific value is concerned in the heating of the mantle and production of light, the question is whether the heat from gases of various qualities is equally applicable for this purpose, as ascertained by comparing the lighting value with the heat supplied by the combustion of various gases, under as nearly as possible equal conditions. They believe that the prevalent supply pressure in Chicago is not specially favourable to any single quality of gas. Variations of supply pressure without any change of lamp adjustment altered the rate of consumption and the efficiency, and generally, when the supply of gas increased, the candle power and efficiency followed suit up to a certain point, beyond which first the efficiency fell off, and, with a further advance, both candle power and efficiency decreased. It is usual to adjust lamps up to the candle power maximum; but the rule with the Chicago maintenance men is to stop a little below this limit—thus reducing liability to the formation of soot, and incidentally bringing the lamp nearer the maximum efficiency point for rich gas. The gases were compared under each of these conditions. The decrease from the point of maximum efficiency was slightly slower with poor than with rich gas, especially under excessive consumption; but this did not mean any special practical advantage.

Air shutter adjustment is important as determining the amount of air mixed with the gas before reaching the flame. A rich gas calls for no special skill in adjusting, as the ports should be fully open. With poor gas, however, the shutter must be partially closed, and some care in regulation is essential. But this is overbalanced by the loss that follows the maladjustment of a rich gas. Excessive air supply to a poor gas results in a relative small loss of efficiency, and is attended with a liability to "pop," or even fire-back, that attracts attention at once and secures a proper adjustment. With a rich gas, however, the result is a larger loss of efficiency and a tendency to "soot" the mantles; so that a greater practical disadvantage might follow the careless usage of such gas.

Comparing a gas "of very high candle power," a 650 B.Th.U., and a 565 B.Th.U. gas, at the point of maximum efficiency, the the light per B.Th.U. is slightly in favour of the poorer gas, and the difference is enhanced at the point of maximum candle power. A comparison of coal and water gas, each of "about 575 B.Th.U.," indicated a slight advantage in favour of the latter. Conditions are uniform in the laboratory; but in actual practice they are liable to vary from hour to hour. The effect of such variations would be greater with rich than with poor gas, as proved by supplying different qualities of gas to a lamp without adjustment of the gas or air supplies. This point must not be overlooked when judging the relative practical usefulness of various qualities of gas. The practical inspection showed that the sooting of mantles and blackening of ceilings are not affected by the quality of the gas used, and there is no reason to suppose that a lower quality of gas tends to shorten the mantle life, or otherwise increase maintenance expense. Incidentally, it was observed that adequate maintenance is an important factor in satisfactory service, irrespective of the quality of gas.

Given uniform quality and good conditions of service, the advantage in favour of the lower quality gas is in excess of the calorimeter indications, and with equal qualities of coal and of water gas the advantage is with the latter; so it appears that the value of a 565 B.Th.U. coal gas compared with a 650 B.Th.U. water gas is substantially indicated by the calorimeter. The proposed lowering of the heating value of the gas would mean 10 to 12 p.ct. less value for the consumer, and the proposed coal gas of similar value would be worth 12 to 14 p.ct. less, as compared with the present supply.

GENEVA GAS SUPPLY.

Unlike many gas undertakings, that of the Geneva Municipality appends to its annual financial statement some general technical data representing average production, &c., for the year. In the report for 1915, only just issued, and published in the "Journal des Usines à Gaz," it is stated that the mean of daily tests of net calorific power, made with the Junkers calorimeter, was 4668 calories for gas at 15° C. and 760 mm. This figure is lower, by 151 calories, than that for the preceding year—ascribed partly to the use of lower-grade coal and partly to the discontinuance of carburetted water gas through shortage of oil.

The mean percentage composition of the gas was: CO_2, 2·4; C_nH_m, 3·5; O, 0·5; CO, 8·2; CH_4, 31·7; H, 49·1; N, 4·6. At the works outlet, the gas contained 26·07 grams of sulphur and 0·066 gram of ammonia per 100 cubic metres—equal respectively to 112 and 0·28 gram per 1000 c.ft. By tests made twice or thrice per day, the strength of the strong ammoniacal liquors was kept as constant as possible. That sold averaged 23·03 p.ct. of ammonia (NH_3), the weak liquor containing only 1·7 p.ct. of ammonia, and the residual washings only 0·003 p.ct. The average quality of the lime used for distillation of ammonia was: Free lime, 70·9 p.ct.; total lime, 73·2 p.ct.

The analysis of the "Luxmasse" purifying material used on the works is quoted as follows: Water, 49·34 p.ct.; ferric hydroxide, 42·55 p.ct.; inert matter, 8·11 p.ct. After use, the material contained 46·65 p.ct. of sulphur and 6·74 p.ct. of prussian blue.

The officials of the Geneva laboratory, where these analyses were made, report that they have also been engaged on the efficient working of boilers, the analysis of waste gases, and other analytical control of working; and they have further taken up a chemical study of tar distillation.

Rules for the Use of Trinitrotoluene.

Rules for the use of trinitrotoluene which recently came into force, and which were made by the Minister of Munitions in pursuance of Regulation 35 A.A. of the Defence of the Realm (Consolidation) Regulations, 1914, have been published by His Majesty's Stationery Office at the price of 1d. They apply to all factories and workshops in which trinitrotoluene or any mixture containing it is used or manipulated. There are two sections, the first of which it is the duty of the employer to observe, while the second imposes duties on every person employed. Efficient ventilation and cleaning are first provided for; and then it is set forth that no person under sixteen years of age shall be employed—and no person under eighteen, unless such employment is approved on behalf of the Ministry of Munitions. No one is to be employed for more than a fortnight without an equal period of work at a process not involving contact with T.N.T., or an equal period of absence from work, unless such employment has been approved by the Medical Officer. At every factory and workshop there is to be a canteen approved by the Welfare Section of the Ministry; and, in addition, every person employed is to be daily supplied, gratis, with half-a-pint of milk or an approved substitute. Then there follow rules to ensure proper clothing, due cleanliness, and medical and welfare supervision. These seem to be very complete—even the minimum size of the towels to be provided being stipulated. The duties of persons employed, though not nearly so numerous, are equally as important, as those of the employers; for it would be useless to provide all the facilities just referred to if the workers did not make proper use of them. A copy of the rules has to be posted in a prominent place in each factory and workshop.

YORKSHIRE JUNIOR GAS ASSOCIATION.

There was a large gathering of the members of the Yorkshire Junior Gas Association on the visit last Saturday afternoon to the works of the Yeadon and Guiseley Gas Company, of which the President of the Association (Mr. J. E. Lister Cooper) is the Manager. The occasion was favoured by fine weather.

The visitors were welcomed by the Chairman of Directors of the Company (Mr. W. Wormald), who remarked that when Mr. Cooper had suggested that the Company should invite the Association to Yeadon and Guiseley, the idea was readily assented to, because anything which made for the welfare of the gas industry had the Board's consideration and support. If the Company had not looked ahead by the acquisition of the new plant, they would have been in an awkward position to-day. It had taken a lot of thought before they had started on this plant—as described in detail in the "JOURNAL" for May 16, 1916, p. 338—which had cost between £16,000 and £17,000. They had, he fully believed, one of the nicest horizontal retort-houses in the district. It took time, of course, to get everything to follow; but they would have it all eventually. During the past year they had had to put in a new main, which had afforded a good deal of relief. The gas industry of the future depended upon the juniors of to-day. It was they who would have the task of future developments and extensions; and therefore the Company had great pleasure in offering the Association a hearty welcome.

Mr. Cooper then conducted the party over the plant, as described in the paper which he read before the Association last May. The visitors viewed first the old retort-house, which formerly contained hand-charged horizontal retorts, but is now largely used as a coke and general store. From here the party were conducted to the engine-house, where the gas-engines have been in use 18 years. Mr. Cooper indicated the prospective site of a Livesey washer which it was intended to fix next summer. There is at present no tar-extractor; reliance being placed simply upon the scrubbing. The plant has a rotary washer. A new main and other equipment have paved the way for a new washer. Passing the foot of the coal elevator, which was in process of loading the bunkers in the retort-house, Mr. Cooper, remarking upon the screened coal in use, said they had for some little time been trying unscreened coal, but had given it up. In the retort-house the party witnessed the discharging of coke and recharging with coal by mechanical combined charger and ram. A visit to the railway showed the manner in which the coke, after dropping from the retort into the quenching chamber, falls into trucks in the subway, and is conveyed along a railway to a hoist, where it is elevated to a gantry, along which runs a railway to convey the coke to the store. The gantry and hoist are recent developments. The original method was by an inclined plane from the subway to the yard level, and a railway thence to the coke-store. If it is desired that clinker or coke be dumped direct into carts, instead of going to the store, there is a drop loader at the commencement of the gantry, under which the cart may be backed. The party next visited the electric power house, where is generated the driving power for the various mechanical appliances on the works; and the tour ended at the governor-house.

TEA IN THE BOARD-ROOM.

After the visit of inspection, the party were entertained to tea in the Board room, by invitation of the Directors. Mr. WORMALD presided, and was supported by Mr. T. Parsons (the Vice-Chairman), and Mr. G. A. Teale (Director).

Mr. J. M'LUSKY (Huddersfield), in proposing a vote of thanks to the Directors and Mr. Cooper, said it was clear from what the party had seen that the Yeadon and Guiseley Company were a very progressive concern. It had been said that all profits were made in the retort-house, and that the costs of these must be kept down as much as possible. They had seen machinery installed there which must reduce costs very much.

Mr. J. W. ROPER (Bradford), in seconding, said the visit had been one well worth paying. Owing to the kindness of Mr. Cooper he had been able to have a previous visit to the works, and he had looked forward very much to this second visit. They had all found much to interest anybody in the industry.

The resolution was carried unanimously.

Mr. PARSONS, in responding, said he was pleased to hear the visitors speak so favourably of the concern. Since he had become connected with the directorship, the works had been turned pretty well inside out two or three times. The present works were initiated by their former Manager—the late Mr. Edward Lister, the uncle of the present Manager. Unfortunately, before his scheme was half completed, he was called away, and the scheme had to be carried through by his successor, Mr. Cooper. There were several things still which ought to be done. They thought baths should be provided for the use of the men after finishing their day's work. This scheme may be carried out at some time. In reference to their Manager, the Directors had been fortunate in securing the services of Mr. Cooper. The Association, too, were fortunate in having appointed Mr. Cooper as their President. He considered the Company had one of the best managers in the West Riding.

Mr. TEALE expressed the pleasure of the Directors in seeing such a large gathering. He hoped they had found something to interest and possibly to instruct them. He was well aware that there were some present who were connected with works of far greater magnitude. However, the Company were proud to keep their works up to date, and run them with efficiency and economy—always remembering, of course, that they were a private company and must make a return to the shareholders. Though he would claim no technical knowledge of the gas industry, since he became a Director of the Company, he had been struck by the amount of bye-products which were obtainable from the manufacture of gas. When he looked at a large city like Leeds or Bradford, and saw the amount of waste which went into the atmosphere, which ought to be utilized in bye-products for the benefit of the community, it occurred to him that there was a wide field open to the industry and to the members of the Association, to try to formulate some scheme of house heating which would utilize the value in the smoke which at present was sent into the atmosphere to pollute it. Houses ought to be lighted and heated by gas appliances, and by use of the industry's bye-products. He believed the most pessimistic of them would agree that after the war great changes must occur. They could not live on the past, and would have to bestir themselves so that out of the minerals in this country, instead of importing, they should get the best use. Gas must be produced at such a price that it would pay householders to use it. Inventions in gas appliances must be produced to get the best heating and power capacity possible. He thought there was a great future before the industry if those connected with it would use their utmost endeavours to see that the best, and only the best, was got out of the material in which they had to deal.

DONATIONS TO THE Y.M.C.A. AND THE BRITISH RED CROSS.

Mr. PETER M'NAB (Hon. Treasurer) reported having sent donations of £5 each to the Y.M.C.A. and the British Red Cross funds, and the receipt of acknowledgments and thanks.

REFRACTORY MATERIALS.

The Ceramic Society's Proceedings.

The Refractory Materials Section of the Ceramic Society made a vigorous start at their first ordinary meeting, held at Leeds last Tuesday. The University authorities had placed rooms at the disposal of the Council, and Mr. WILLIAM OATES presided over a large gathering.

Prof. P. F. KENDALL, M.Sc., F.G.S., gave an instructive address, illustrated by lantern slides and specimens, on the "Clays of Northern and Central Yorkshire," which was supplemented by an account of the petrological and mineralogical characters of these clays and their associated shales and sandstones, by Mr. A. GILLIGAN, B.Sc., F.G.S.

ZIRCONIA AS A REFRACTORY MATERIAL.

Mr. J. A. AUDLEY, B.Sc., then read a paper on the "Use of Zirconia as a Refractory Material." Zirconia, he said, is widely distributed, but mostly in small quantities, and chiefly as the mineral zircon. Zirconia itself, however, has been discovered in considerable abundance in Southern Brazil, as the mineral baddeleyite, which contains on the average about 84 p.ct. of pure zirconia. It is interesting to note that zirconia is obtained as a bye-product from the monazite sands which yield the thoria and cerium dioxide for incandescent gas-mantles. Baddeleyite has a hardness of 6·5, sp. gr. 4·4 to 6, and colour from white and light grey to very dark grey, sometimes dark green and brown. It is insoluble in acids, except hydrofluoric acid, but is easily attacked by fused potassium hydrogen sulphate.

The melting-point of zirconia is very high—nearly 2000° C. for the ordinary raw zirconia, and much higher when purified; and it strongly resists both acid and basic slags, as well as fused cyanides and alkalies. The only reagents which seriously attack it are melting bisulphates and fluorides. Its conductivity for heat and its co-efficient of thermal expansion are both very low; and it can be plunged while red-hot into water without cracking or breaking. Native zirconia, containing 80 p.ct. or more zirconia, possesses all these properties. As Dr. W. Rosenhain pointed out at the Faraday Society's recent discussion on "Refractory Materials," the amount of iron oxide in crude zirconia can be considerably reduced by treatment with dilute sulphuric or hydrochloric acid.

The expense of zirconia bricks is stated to be compensated by the special qualities of the material. These bricks have been used in Germany for lining the hearth of a Siemens-Martin steel-furnace, and have been favourably reported upon. Mixtures of zirconia with other substances—such as carborundum or clay—have been recommended for special purposes. Before the war, crude zirconia, with 85 p.ct. ZrO_2, was sold for £31 per metric ton [= 1000 kilog., or 2204 lbs.]; and purified material was sold at prices ranging from £35 to £50 per metric ton. These figures, with some other information, were supplied by Messrs. Ridge-Beedle & Co., of Glasgow, who also exhibited a zirconia brick, which created much interest.

E. Podszus recently stated that fused zirconia, or even zirconia which has been heated above 2000° C., is well adapted for making refractory ware, being no longer liable to crack and fall to pieces like ordinary raw zirconia used without a bond. Such ware is burned at 2300° to 2400° C., in a cylindrical furnace made chiefly of fused zirconia. The fuel used is coal gas, acetylene, or petroleum with air-blast until the temperature ceases to rise, when a blast of oxygen is put on instead of air. O. Ruff and G. Lauschke recently made an elaborate investigation of the refractoriness, &c., of zirconia, by itself and mixed with certain other oxides. The raw and pure zirconia had respectively 83·53 and 98·73 p.ct. of pure ZrO_2. The mean melting temperature of the zirconia was found to be 2563° ± 10° C. Alumina melted at 2005° and 2008°. Beryllium oxide and yttria each melted above 2400°; but

thoria was not melted at 2790°, though it began to volatilize at 2450°. It was found that crucibles of pure zirconia did not fall to pieces when burned at 2000°, only slowly when burned at 2200°, and quickly when burned at 2400°. Adding 3 p.ct. of alumina lessened this falling to pieces, and 6 p.ct. stopped it completely, even when burned at 2400°. The general conclusion was that, for burning at 2000°, the most suitable addition to zirconia is about 1 p.ct. of alumina; at 2200°, about 1 p.ct. of thoria; and at 2400°, about 1 to 3 p.ct. of yttria. Larger additions than those specified are useless, and increase porosity.

The afternoon proceedings were opened by the reading of a paper by Mr. B. J. Allen, on a "Process of Manufacturing Heavy Fire-Clay and Similar Articles," which had reference to a method of casting under reduced pressure, and also to the use of electric currents in connection with casting.

Dr. J. W. Mellor communicated by title a paper, "Can the Firing Temperature of Clay and Silica Goods be Estimated from the Microscopic Appearance of the Finished Product?" His conclusion was that it cannot.

Spalling of Magnesite Bricks.

The next paper, also by Dr. Mellor, was on "The Spalling of Magnesite Bricks." He pointed out that the specific gravity of magnesite has a wide range, from 3·2 (as in amorphous powder) to 3·7 (in crystallized magnesia). The specific gravity of the amorphous form increases very gradually when heated, until finally it approaches that of the crystalline variety. Thus in the case of ordinary calcined magnesite there is the possibility of contracting 7 p.ct., as the specific gravity of bricks changes from 3·44 (that of some bricks on the market) to 3·7. Assuming two varieties of magnesia to exist having the extreme specific gravities (3·2 and 3·7), it may be found by calculation that the commercial bricks of sp. gr. 3·44 contain the equivalent of 40·5 p.ct. of the high specific gravity form, and 59·5 p.ct. remaining to be transformed. This possibility of 7 p.ct. contraction must render the magnesite lining of a high-temperature furnace liable to crack and spall, because the low conductivity of it for heat makes the contraction occur mainly upon the hot face of the brick. It is the repeated spalling or flaking of pieces up to 2 in. in thickness, rather than ordinary wear and tear of furnace linings, that makes the bricks break-down. The forms of magnesia, with low and high specific gravity respectively, differ also in other properties, and may be termed α-magnesia and β-magnesia. The former readily absorbs gases, moisture, &c., and readily dissolves in mineral acids, &c.; while β-magnesia strongly resists these influences.

By calcining raw magnesia repeatedly between 1300° and 1350°, and similar samples at other temperatures, keeping the conditions as nearly uniform as possible, the general results showed that: (1) Conversion of α- to β-magnesia is relatively slow, and requires time; (2) the higher the temperature of calcination, the faster the transformation from the α- to the β-form; and (3) the different types of magnesite have their own specific rates of conversion. The rate of conversion seems to be faster with the more ferruginous magnesites—Austrian is quicker than the purer Grecian. The material must, therefore, be retained at a high temperature for a definite time, to ensure extensive conversion.

A magnesite brick which had been used in the electric oven was found to have a porosity of 11·0 p.ct. near the end heated by the electric arc, and 19·4 p.ct. at the cooler end. The corresponding difference in contraction must be added to that caused by change in character of the magnesite. It is found by calculation from the given figures that the total contraction by volume of the brick-face when exposed in the lining of the electric furnace is 15·8 p.ct., or 5·8 p.ct. linear. The separate effects are 5·99 p.ct. contraction by shrinkage of magnesia and 9·81 p.ct. contraction by closing of the pores, making a total of 15·8 p.ct. contraction by volume. The tendency to spalling, therefore, depends on at least two important factors—the diminution in specific gravity of the magnesite brick, and the reduction in the porosity of the brick. The three most important factors controlling the porosity of the finished brick under the present conditions of manufacture are: (1) The finishing temperature of the kiln; (2) the pressure used in making the bricks; and (3) the grain-size of the materials.

The strains set up by a sudden chilling of the hot furnace may aggravate spalling primarily produced when bricks are made with too high a porosity from imperfectly shrunk magnesia. If no serious factor has been overlooked, it ought to be possible to determine by preliminary tests whether a magnesite brick is likely to spall seriously; and the manufacturer should be able to obtain definite objectives in order to reduce spalling to a minimum. For the purposes of a specification for magnesite bricks, a contraction test analogous with that of the gas engineers' specification could be devised, or permissible limits for the proportion of unconverted magnesite, and also for porosity, could be arranged.

Measuring Temperatures.

In the evening, Prof. J. W. Cobb, B.Sc., lectured on "Temperature Measurements in Clay-Works Practice." In the case of mercury thermometers, the importance of having a plainly marked milk-glass scale was emphasized. Mention was also made of the L shape, and the chain thermometer, and of the type with compressed nitrogen above the mercury for use at temperatures of 250° to about 450° C. The thermo-couple made from wires of platinum and platinum-rhodium was then described, and the method of calibration. Reference was made to the fact that copper-constantan and nickel-nichrome couples, which cannot be relied upon beyond 600°, compared with the 1400° or higher of the couples first mentioned.

As an example of a recording instrument, the Cambridge Scientific Instrument Company's "Thread Recorder" was explained and shown in action; while for still higher temperatures, the use of the Féry radiation pyrometer was illustrated. An optical thermometer was also explained, in which the brightness of a lamp filament is altered by varying resistance.

The same effects can be produced by a lower temperature acting over a longer period as by a higher temperature acting for a shorter period. When working on silicate mixtures, Prof. Cobb found that the same effect was produced at a temperature of 1200° maintained for three days as at 1300° in six hours. Hence the temperature-time-atmosphere effect may need to be indicated by other methods of control than those so far considered. A simple method is by using Watkin's heat recorder, in which a series of mixtures having different melting-points is used—each mixture being supposed to represent a standard fluxing effect.

Seger cones constitute the classical example; and these have been of tremendous value to the ceramic industry. It is unfortunate that they are made so small, because they are difficult to see in position. Prof. Cobb has himself found it necessary to increase the size considerably. Small cones in a furnace are very apt to receive accidental heat-waves, which would have much less effect on larger objects. The use of a larger cone gives what may be called a thermal inertia to the system. The principle on which the cone depends demands some precision in shape. Pressing the cones is not an easy matter; but it is simpler when they are made in the form of a wedge with a thin edge and no point. These, however, were found to be top-heavy, and apt to go too far when they started to go. Making the top of the wedge half the size of the bottom gave satisfactory results. Now that Seger cones are being manufactured in this country, he hoped the disadvantages would not be perpetuated. For some purposes, preference is given to Holdcroft bars, instead of Seger cones. These are also standard silicate compositions, whose use depends on the collapse of a small beam.

After a brief notice of the Wedgwood pyrometer (the first real measuring instrument for pottery), reference was made to Buller's rings, also standard compositions which depend on contraction, measured by a simple multiplying device. Various appliances were exhibited in action.

Mr. Thornton's Society of Arts Paper.—April 18 is the date fixed for the reading before the Royal Society of Arts by Mr. H. M. Thornton of his paper on the "Application of Coal Gas to Industry in War Time: Its National Importance."

The late Mr. William King, J.P., who was Engineer to the Liverpool Gas Company from 1867 to 1904, and whose estate is valued at £28,830, has left an oak table made from the piles of Old London Bridge to the London Museum, and a picture by Peter Ghent to the Liverpool Art Gallery. Subject to his wife's life interest, bequests are made to the National Lifeboat Institution, various hospitals, and the benevolent fund of the Institution of Civil Engineers.

Calorific Power Orders and Application.—The Board of Trade have made Orders under the Gas (Standard of Calorific Power) Act, 1916, in respect of the Bordon and District Gas Company, the British Gas Light Company, Ltd. (Staffordshire Potteries undertaking), and the Portsea Island Gas Light Company. The Local Government Board have made an Order for the Borough of St. Helens. The Board of Trade have received an application for an Order (with a standard of 500 B.Th.U.) from the Radcliffe and Pilkington Gas Company.

Briquette Making at Nuremberg.—For making briquettes at the Nuremberg Gas-Works, coke breeze and pitch dust are incorporated in a mixer heated by superheated steam at 200° C., and the mixture treated in a rotary press. Eight per cent. of hard pitch is used; and the crushing strength of the oval briquettes averages 1137 lbs. per sq. in. The strength of the briquettes depends chiefly on three factors—the proportion of binding material, the description or softness of the pitch used, and the pressure which the outer edges of the two rollers exert on one another. The proportion of pitch added cannot be varied much, because if it is too low the briquettes lack solidity or strength, and if it is too high they stick in the mould.

Order as to Priority.—The Minister of Munitions has issued an Order in which it is required that "all persons engaged in any of the trades, businesses, or industries specified in the third schedule thereto shall in all respects comply with certain directions and regulations duly set forth" as to the priority to be given to work carried out in their factories and workshops and elsewhere in, or in connection with, such trades, businesses, or industries, or any of them. Among the trades, businesses, and industries included in the schedule referred to are the manufacture of coal-tar products, dyestuffs, and other chemical products, the manufacture of coke, and electricity, gas, and water services. This Order is to be substituted for Circular L33. The order and schedules will be found in the advertisement pages of this issue.

TAR.

By Reginald Cross, of the Tradeston Chemical Works of the Glasgow Gas Department.

[A Paper read before the Scottish Junior Gas Association, Western District, Feb. 17.]

The events of the past two-and-a-half years have turned our attention, with increased interest, to this important bye-product of the gas and coke industry—coal tar; and I think you will agree with me when I say it is now generally recognized as one of the most valuable of our raw materials.

The product is not new to us; it is as old as the gas industry itself. But it has taken a European war to bring it to its present position of importance—at least, so far as this country is concerned. How different is the position it holds to-day compared with the early days of gas manufacture! To the pioneers of the industry it was a nuisance; and, among the difficult problems which they had to solve, one of them was, "What shall we do with our tar?" It had then no commercial value, and the gas manager had no good use for it except perhaps to burn it, and that would probably give him as much trouble as disposing of it in some other way. However, this method of disposal had its virtue, that it did not inflict the nuisance on anybody else.

Butwith the advent of tar distilling (in 18– something) matters changed. Industrial uses were found for the products of tar; and consequently there was a gradually increasing demand for the raw material. Thus, from being a worthless—and at the same time I might say a costly—nuisance, it became a source of revenue. And so it has continued (and will continue); its value, no doubt, fluctuating with the ups and downs of markets, but always a considerable source of revenue. From this point of view, the gas manager will continue to regard it with a business eye.

Present-Day Restrictions.

But apart altogether from the commercial side of the question, our interest in coal tar, whether we are gas managers or not, has a wider aspect to-day. Two-and-a-half years ago a producer of tar could dispose of his product in any way he pleased; but now he is restricted in this sense, that he must distil it himself or dispose of it for distillation. Similarly a tar distiller could take in as much tar as he desired, without saying how much to anyone. He might distil it and dispose of his products in whatever way he pleased. But now he must regularly report to the Government Department concerned the quantity of tar he has received, its source or sources, the yield of products obtained. and to whom he has disposed of them; and, in addition, there are certain of his products—benzol, toluol, and carbolic acid—which must be reserved entirely for national uses; these being required for explosives manufacture or motor purposes as the case may be. Further, no tar or tar product may be exported except under licence. And, in addition to all this, a recent order issued by the Ministry of Munitions makes it compulsory on all engaged in production, manufacture, purchase, sale, or distribution of any coal tar or coke-oven bye-products to furnish to the Minister of Munitions such particulars as may be required as to output, working of plant, cost of manufacture, sales, deliveries, stocks, purchases, and prices.

All this then goes to indicate our increased interest in coal tar—it is the part it is, or more correctly some of its products are, playing in the present war. It is unquestionably a bye-product of prime national importance; and I am convinced it is no exaggeration to say that had one side been without the use of coal-tar derivatives, there would have been little doubt as to the outcome of the military operations.

Sources and Composition of Coal Tar.

Now in regard to the sources of coal tar. As you are aware, the principal production in this country is from gas-works; and next in order is that from coke-ovens. The supply from coke-ovens has increased very rapidly of late years, is still increasing, and will continue to increase, more especially if the boom in our iron and steel industries materializes as is prophesied by some as one of the "after-war" effects. Then we have a supply from blast-furnaces and producer plants. The quantities derived from these latter sources are comparatively small, though not unimportant; but the tars themselves are not akin to those of gas-works and coke-oven origin.

There is one point, however, common with all tars, whether their source be gas-works, coke-ovens, blast-furnaces, or producers. I refer to their complexity of composition. I have seen it stated there have been something over two hundred compounds of known chemical composition isolated from coal tar. But an ultimate analysis has never been carried out, and possibly never will be. It has been said there are no two tars alike, even though their source be identical. This is a perfectly safe statement to make, knowing how difficult it would be to prove the contrary. But to the average tar distiller, his interest in the composition of a tar, so far as individual constituents are concerned, is limited to a very few of its components, such as benzene, toluene, the xylenes, carbolic acid, the cresols, naphthalene, anthracene, and pyridine. These, of course, are most important compounds, some of them more especially so in these stirring times; and the proportions in which they are present in a tar will influence its value considerably—according to market conditions, of course. I do not suggest that the distiller isolates these products in the form I have mentioned them. He really does not in the majority of cases, but markets them as benzol, toluol, solvent naphtha, 60's carbolic, and so on—these being mixtures of the various compounds.

I may here remark that since the beginning of the war there have been one or two excellent methods devised for the determination of the content of benzene and toluene in benzols, toluol, and solvent naphtha. They may be also applied in the case of light oil and crude naphtha, which means, of course, that the benzene and toluol content of a tar may be more readily determined, and I believe more accurately.

Nowadays there is a tendency to consider a gas-works as in the same category as a chemical works; and though everyone may not agree with this view, I think it holds in gas manufacture as in a purely chemical process that regularity of working conditions tends to regularity of product, as to quantity and quality. Gas we know to be the primary aim of the gas manager; and we are open to assume that in every plant the best working conditions are known, and efforts are made to regularize the working accordingly. On the assumption, then, that the make of gas in any particular works is standardized as nearly as possible, it should follow, I would say, that the yield and the quality of the secondary product—tar—would also be regular within the same limits. But this, of course, would depend very particularly on the coal being used. If the same class of coal was in use, the matter would be simplified; but in a large works, where perhaps several varieties were being carbonized at the same time, and the proportion of each was constantly changing, there might conceivably be considerable differences in the quantity and the quality of the tar produced.

Carbonization Conditions and Tar Productions.

The gas-works chemist is the man to tell us the differences which exist in the various classes of coal, and the results they give on carbonization. I cannot go into the matter at all fully, nor is it within the scope of my paper to do so; but I understand the variations are sometimes considerable, even with coals from the same field. It has been established [Deville and Bunte] that the yield of tar increases with the percentage of oxygen in the coal; and one might expect with this increase in the quantity of tar an increase in its phenolic compounds, though this figure will be more or less affected by the conditions prevailing in the retort during the period of carbonization. Though the quality of the coal will have considerable influence on the quantity and quality of tar produced, the most potent factor in the process of carbonization in any type of retort is temperature.

Most of you, I believe, would notice the supplementary report on "Thermal Phenomena in Carbonization," which was read at the last meeting of the Institution of Gas Engineers. When I read it, I was interested not so much from the thermal point of view as by the indications it seemed to give of the characteristics of the tars that are obtainable at various temperatures. It pointed to what I might call critical periods in the process of carbonization—periods in which there were marked changes in the composition of the gases produced, and which would be accompanied by changes in the quantity and composition of the tars. Between 400° and 600° C., it said there were produced "oils, unsaturated hydrocarbons, higher paraffins, and oxygenated compounds. Between 600° and 800° methane is evolved, which would indicate a splitting-up of paraffins. Above 800° hydrogen becomes the main product, pointing to a further (and ultimate) decomposition and possibly condensations. The 400° to 600° stage covers the low-temperature processes of which we have heard so much of late years, and in which the yield of "tar" may reach from 10 to 20 p.ct., consisting essentially of paraffins and unsaturated hydrocarbons. This low-temperature tar is more of the nature of an oil; and it appears to differ so very markedly from ordinary gas tars, that it would be incorrect to class it in that category. Of course, in these low-temperature processes, liquid products are the main object.

Up to 800° and above, which used to be a common working temperature (and which is still maintained at some of the smaller works) would come what we may describe as a low-temperature horizontal tar. The yield in this case is about 7 p.ct. The tars are very fluid, and consist principally of aromatic compounds (hydrocarbons of the benzene series) with paraffins and unsaturated hydrocarbons. They give a good yield of light oils, and are low in naphthalene. Above 800° and reaching to 1000° and over are the high-temperature horizontal tars. The high temperature of carbonization marks its effect in a very decided manner in the yield of these tars (which runs about 5 p.ct.) and also in the quality. They are much heavier in gravity; and they give only about 1 to 1½ p.ct. of distillate up to 170°, and contain a very large amount of naphthalene. Paraffins are present only in small quantity. In days of old, when works were operating at moderate temperatures, it was quite the usual thing to get 13 to 14 gallons of tar per ton of coal; but following the change to higher heats, a reduction of from about 25 to 30 p.ct. has taken place. Possibly, however, a part of this decrease may be due to a different quality of coal being used.

The change to high temperature was introduced, I believe, with the main object of getting a higher yield of gas; but if one gets the carbon compounds in the form of gas, one cannot also expect to get them in the form of tar. So no doubt a decrease in the yield of tar was anticipated. High temperature tars, as I have

previously indicated, are low in the fraction boiling up to 170°—*i.e.*, the principal fraction containing benzene, toluene, &c. The production in the retort is lower; and of what is formed a relatively greater proportion is carried off by the gas—the increase in the amount carried away being the quantity necessary to saturate the extra yield of 1000 to 1500 c.ft. at the temperature it leaves the system.

Other factors influencing the yield—and if you alter the yield you are almost certain to alter the quality—of tar are pressure, the fullness of the retort, and the period of carbonization; and there are others which possibly you could mention. The effects of pressure are often very noticeable in the scurf on the retorts (the visible evidence of disruptive action); but what its effect on the tars will be, I am not certain, though I am inclined to believe it will be favourable. Weight of charge and period of carbonization go together. A full retort is supposed to give more tar, which seems theoretically sound, though I have seen the opposite view expressed. The quality is generally admitted, I think, to be better.

Consideration of matters of this nature are difficult for the man in the tar-works. He may notice a difference in the tar—and tars even from the same works do differ considerably at times—but he is not in touch with conditions in the gas-works, and so the matter ends there. Here, again, is where the gas-works chemist—conversant with producing conditions, and with his experimental plant—might step in and give some interesting data, if he had time.

Tars from Vertical Retorts.

Vertical tars I would say are in a class by themselves. They are obtained in greater quantity than horizontal tars. From 12½ to 14½ gallons per ton are, I believe, produced on some plants; though, owing to their lighter gravity, the yield by weight is much the same as for the lower temperature horizontals tars—viz., about 7 p.ct. They are very low in free carbon and naphthalene, and give a large yield of oil on distillation. One sample which I distilled gave no less than 55 p.ct. of oil. The absence of naphthalene, or the presence of it in small quantity, is a fairly safe indication of the presence of paraffins; and these I believe are present in vertical tars in rather large quantity, though I have not attempted to estimate them.

Coke-Oven Tar.

Regarding coke-oven tar, I cannot say anything from practical knowledge; but I understand they vary over very wide limits. Indeed, I suppose the same might be said of gas tars, or any tars for that matter. The naphthalene content of coke-oven tar is higher if anything than for high-temperature gas tar. In regard to this point, I am assured a moisture content of over 10 p.ct. in the coal has the effect of increasing the percentage of naphthalene in the tar. High top heats in the ovens result in a cracking of the vapours producing tars of heavier gravities, rich in free carbon, naphthalene, and anthracene, and low in oils and phenols. Low top heats, on the other hand, give fluid tars, low in free carbon, and high in oils and phenols, but containing less naphthalene and anthracene.

Results of Tests.

I have distilled several samples of various tars, and give you the results as follows:

Coke-Oven Tars.

	A.	B.
Water	3·0 p.ct.	7·0 p.ct.
210	1·3 ,,	1·5 ,,
240	6·5 ,,	4·0 ,,
270	20·25 ,,	8·4 ,,
350	18·25 ,,	19·6 ,,
Pitch	49·0 ,,	58·6 ,,
Loss	1·70 ,,	·9 ,,
	100·00	100·0

My tests, I may say, were only on a small scale; and the results obtained are, therefore, no guide to practical working. Each distillation was carried out in the same retort; and the rate of distillation regulated as nearly as possible, so that the figures must be regarded as comparative—nothing else. As the "C" process was in operation at the works from which we derive our tar, I had to obtain a sample from a source where the "C" process was not being worked; and the results shown under the heading "H.T.H." are of this tar.

You will notice I have included a producer tar, and also a suction-gas tar, samples of which I was able to obtain. These tars you will see differ materially from the gas tars. There will be so little suction tar on the market that it is of little or no importance. But having got the sample, I thought I should like to know how it compared with the others. Perhaps you will allow me to go over as briefly as I can the results of the tests, and make any comments I consider necessary.

Specific Gravity.—"H.T.H." was the highest at 1·190, as we would expect; then comes "L.T.H." at 1·130; and vertical is much lighter at 1·065. Suction tar was approximately 1·058; but as it was practically a watery emulsion, an accurate figure was almost impossible. The producer tar was solid; and to get a sample for distillation it had to be broken with hammer and chisel.

Water Content.—The horizontal tars gave rather less than is obtained in practical working. The vertical figure, some 4 p.ct., is nearer the practical. Producer tar gave 6·5 p.ct.; and this tar gave more trouble to distil than any of the others. It would persist in coming over; and I had to begin over again three times before I could complete the distillation. You will notice that this tar gave practically no oils up to 230°; and to this I ascribe the difficulty I had in distilling off the water. Certainly with tars containing an average percentage of light oils, one gets over the water much easier. The suction tar contained 19·7 p.ct. of water; so one would not require to pay much for this variety of tar.

Distillates at 170°.—The horizontal percentages are about the usual; but I expected higher than 2·7 from the vertical. Suction tar gave 1·3 p.ct., but producer only 0·8 p.ct. at this particular temperature.

Distillates at 230°.—The yields from the horizontal tars are about the average; and you will notice vertical tar gave no less than 20·9 p.ct. Producer tar gave even less for this fraction than at 170°. This fraction from the "H.T.H." tar gave quite a considerable deposit of naphthalene; but the others from the gas tars were clear.

Distillates at 270° *and* 350°.—There is little to remark in the percentages, unless perhaps to note the considerable difference in the yield from vertical at 350°, compared with the horizontal variety. Suction tar gave exactly the same figure as vertical. The percentages are stated by weight; but as the specific gravities of each fraction are given, it is quite easy to convert into volume if interested. Naphthalene was deposited in small quantity from the 270° vertical fraction, and rather more from the "L.T.H.;" but the "H.T.H." was almost solid. Naphthalene is evidently present in the vertical 270° fraction in greater quantity than might be supposed, as I found by distilling over a portion of the fraction that an appreciable quantity crystallized out from the distillate. The larger volume of oil in the case of the vertical will exert a solvent action; thus holding the naphthalene in suspension in the original fraction. The 350° fractions from the horizontals came over a clear greenish-yellow colour, which on standing for some time changed to a dark greenish brown. They remained fairly mobile. With vertical tar, however, the fraction was a clear reddish brown colour, which gradually changed to greenish brown, but only after standing a considerable time. It is decidedly less mobile, and has quite the appearance of a fatty oil. No doubt, the presence in larger quantity of hydrocarbons not of the benzene series will account for these differences. This is also indicated by the decrease in gravity of the various oil fractions; those derived from the tars which we would assume to contain a more or less percentage of paraffin or unsaturated hydrocarbons being decidedly lower.

Pitches.—The large yield of oil from vertical tar is reflected in the small yield of pitch—40 p.ct. The "L.T.H." twisted at 110° Fahr., which is rather low for medium soft quality, and indicates that the distillation might have been carried further. The same remark applies to the suction product. On the other hand, the producer distillation was evidently taken too far, as this pitch did not twist till nearer 150° Fahr., which is too hard. The free carbon in the three gas pitches was estimated by the extraction method; the volatile matter, by heating in a platinum crucible over a bunsen burner. The appearance of the various pitches was very similar. But there was this noticeable exception—the

—	High Temperature Horizontal Tar.	Sp. Gr.	Lower Temperature Horizontal (Country) Tar.	Sp. Gr.	Vertical Tar.	Sp. Gr.	Producer Tar.	Sp. Gr.	Suction-Gas Tar.	Sp. Gr.
Specific gravity	1·190	..	1·130	..	1·065	..	1·110	..	1·058 (approx.)	..
Water	2·5 p.ct. Wt.	..	2·5 p.ct. Wt.	..	4 p.ct. Wt.	..	6·5 p.ct. Wt.	..	19 7 p.ct. Wt.	..
At 170°	1·25 ,, ,,	0·912	3·1 ,, ,,	0·891	2·7 ,, ,,	0·858	0·8 ,, ,,	?	1·3 ,, ,,	?
,, 230°	8·5 ,, ,,	1·000	14·3 ,, ,,	0·969	20·9 ,, ,,	0·945	0·6 ,, ,,	?	3 0 ,, ,,	0·899
,, 270°	10·93 ,, ,,	1·025	12·3 ,, ,,	1·012	12·6 ,, ,,	0·989	6·7 ,, ,,	0 955	11·0 ,, ,,	0·957
,, 350°	6·05 ,, ,,	1·055	5·4 ,, ,,	1·046	19·3 ,, ,,	1·025	16·8 ,, ,,	1·007	19·3 ,, ,,	1·008
Pitch	69·22 ,, ,,	1·28	61·4 ,, ,,	1·24	40 p.ct.	1·20	67·0 ,, ,,	1·21	43·5 ,, ,,	1·17
Soda extract (total distillation)	12 p.ct.	..	17 p.ct.	..	22 ,,	...	18 p.ct.	..	19 p.ct.	..
Acid ,, ,, ,,	3·5 ,,	..	7 ,,	..	5 ,,	..	1 ,,	..	12 ,,	..
Free carbon in tar	16·35 ,,	..	8 3 ,,	..	1·11 ,,	..	..	..	..	..
,, in pitch	29·45 ,,	..	16·4 ,,	..	10 ,,	..	..	..	..	..
Volatile matter in ,,	61·9 ,,	..	61·5 ,,	..	78 8 ,,	..	75 ,,	..	84·8 ,,	..
Melting point of pitch	164° F.	..	138° F.	..	166° F.	..	175 ,,	..	128° F.	..
Twisting point ,,	135° F.	..	110° F.	..	134° F.	..	above 140° F.	..	105° F.	..

"H.T.H." had not the brilliant black lustre of the others; and this lustre was not so pronounced in the "L.T.H."

Bases and Acids.—I extracted the several oil fractions (where I had a sufficient quantity) with soda, to determine tar acids. The 230° fraction (with the exception of suction) gave the highest percentage; while the 270° suction fraction gave 3 p.ct. more than the 230°. The presence of pyridine was very pronounced in the washed oils of the lower fractions from the horizontal tars; but it was much less so in the case of the vertical oils. I could not detect it by smell in the producer or suction tars. I also extracted the total oils from each tar with weak acid to estimate the bases. I was surprised at the high figure for suction and "L.T.H.," and the low figure for producer. So I checked them again, with the same result. However, do not accept the figures as representing actual bases—they merely show loss in volume, presumably due to bases. The quantities I was handling were small; and it was quite impossible to make an examination of the extracts.

There was another experiment that I carried out, which is not shown in the results that I have been reviewing. I was curious to know the effect of adding free carbon to a tar already low in this content, and to note the result on distillation. I took the vertical tar, which contained only 1·11 p.ct. of free carbon, and added a further 10 p.ct. of lampblack, added in small portions and well shaken up after each addition. The distillation resulted as follows:

90 p.ct. Tar and 10 p.ct. Carbon. p.ct. Wt.				Same Tar distilled alone. p.ct. Wt.			
H2O	4 p.ct.			4 p.ct.			
170	4·6 p.ct.	23·7 p.ct.	50 p.ct.	2·7 p.ct.	23·6 p.ct.	55·5 p.c.	
230	19·1 p.ct.			20·9 p.ct.			
270	10·1 p.ct.	26·3 p.ct.		12·6 p.ct.	31·9 p.ct.		
350	16·2 p.ct.			19·3 p.ct.			
Pitch	45·1 p.ct.			40·0 p.ct.			

The addition of carbon, therefore, apparently gave 5·5 p.ct. less oils but 5·1 p.ct. more pitch. But what is the result, having regard to the quantity of tar employed in each test? In the tar-carbon test I had only 90 p.ct. tar; in the other, of course, there was 100 p.ct. And taking the yield of oil up to 230° from the latter—viz., 23·6 p.ct., the proportionate amount for 90 p.ct. of tar would be 21·2 p.ct., whereas the test gave 23·7 p.ct., equal to an increase of 2·5 p.ct. This increase, however, is counterbalanced in the fractions from 230° to 350°, where the tar carbon gave 2·4 p.ct. less than the proportional figure calculated for 90 p.ct. of tar. The result then of adding carbon was to increase the distillates to 230°, but almost exactly at the expense of those following—the percentage yield of total oil obtained from the tar employed being the same in each case.

Initial Treatment of Tar.

I shall not say anything about the treatment of the various tar distillates in the tar distillery, as this ground has already been covered in a paper read to us some years ago. But I might say a word or two about the method employed in the initial treatment of tar in this country. In many works now the crude tar, before it enters the still, is subjected to some form of preheating, with the object of taking off most of the light oils and water. I know of a works where the condenser tanks were filled with tar instead of water; the crude tar thus being heated by the exchange of heat from the hot distillates passing over. But I believe this method was discontinued. At another works, the pipes conveying the distillates from the stills are led through a tank in which crude tar is stored. Certainly if an efficient preheating arrangement can be adopted, it shortens and simplifies the after-distillation, not to mention the saving in fuel costs, which will be worth something these days. There is plenty of waste heat about most tar-works; and, as far as my knowledge goes, more use might be made of it.

Distillation.

With regard to the distillation proper, this is carried out by means of direct fire in conjunction with open steam. The tar stills are usually of the vertical type, with concave bottoms or egg-end bottoms. The latter is the type of still favoured in Glasgow. It works a charge of 36 tons of crude tar. The head of tar in a still of this size and type, when filled to working capacity, is high—being equivalent to almost 9 lbs. per sq. in. at the centre of the still bottom. The bottom layer of tar is subjected, therefore, to this increase of pressure, and is in contact with the hottest part of the still. These conditions will conduce, I think, to an increase in the free carbon content and consequently the pitch content. It is good practice, I consider, in tar distillation, to get over the fractions in as short a time as possible (there is a limit, of course), and at as low a temperature as may be. To attain this one would suppose more advantage might be taken of means of suction or vacuum.

Perhaps you would have noticed the description of the plant of Dr. Raschig as given in the "Gas Journal" in the course of last year. It is worked on the continuous principle, and consists of three stills—the first two heated by steam and the third by superheated water. The tar does not come into direct contact with either steam or water. The crude tar entering the system is preheated by the hot pitch leaving the plant, and its temperature is thereby raised to 100°, at which it enters the first still, where, by means of close steam, its temperature is further raised to 140° to 170°. The ammoniacal liquor and light oils are distilled off in this still at atmospheric pressure. In the second still the temperature of the tar is maintained at about the same degree; but the pressure is reduced. As a result the constituents of the tar boiling up to 200° to 230° are volatilized. In the third still the temperature of the tar is increased to about 300° (superheated water being used to effect this); and this still is also put under vacuum. This secures the separation of the higher boiling oils at a temperature lower than would be possible with the direct-fired system.

You will see that in this process no direct fire is used. A plant of this kind would no doubt call for more careful supervision than an ordinary tar-still; and that might be its greatest fault. But in my opinion it will effect the preliminary distillation of tar in a thoroughly scientific manner. The Raschig plant, of course, has been designed for German tars; but it is not so much the plant as the principles involved in it to which I wished to call attention. I firmly believe the yield of oils from a plant embodying similar principles will be considerably higher than by our direct-fired system; and any method which would give a better oil yield is to be desired, so long as the respective prices of pitch and oils remain where they are at present. Thirteen years ago the order of values was reversed. Pitch then was about 60s. per ton, and oil about 30s. Under these conditions, of course, the more pitch obtained the better. There is no immediate indication of a return to this level of values; so let us see how it would work out if it were possible to increase the oil yield from a tar by 5 p.ct. with a corresponding reduction in the pitch, and the level of prices as they are at present. For the sake of simplicity, we will say the price of oil is £3 per ton (£15 in all), and pitch £1 per ton (£5 in all). There would thus be a better return of £10 per 100 tons of tar, or 2s. per ton, which, if from 10,000 to 12,000 tons per annum were being put through, would be well worth having.

As already indicated, open steam is largely employed, especially in the later stages of tar distillation. At one works I know of, it used to be the practice to fire-up to 5° to 6° Tw.; then introduce steam, and complete the distillation with steam alone. However, this method has now been discontinued. The usual procedure in most works, I believe, is to introduce steam early in the creosote fraction, and continue it, in conjunction with direct firing-up, to 1° or 2° Tw. from the finish. Direct firing is then stopped, and the distillation completed by steam alone. It requires very considerable heat to drive over the heavier portion of the oils; and the assistance of steam is, therefore, a distinct advantage. Its beneficent action lies in the aid it affords the hydrocarbon vapours in their passage from the still, thus shortening the period of distillation. The H_2O vapour may also conceivably afford some protection to the carbon compounds, preventing contact with hot free carbon and the hot sides of the still—thus reducing the cracking action in the later stages. It also enables the distillation to be completed at a lower temperature than would be possible without it. I have examined some of the oils at various stages of the distillation, taking samples immediately before steam was admitted and at intervals of five or six minutes afterwards. But there is nothing to note about them; any differences observed being only what one might expect from the later period of the running. It may be said that a larger volume of oils is obtained with the use of steam than without it, and the pitch is of better quality—at least we have found it so.

The extent of the cracking action which will take place in the later stages of tar distillation will vary with the different nature of the tars. Benzenoid tars—that is, tars of the high temperature horizontal class which I have described—are the most stable. These tars consist principally of aromatic hydrocarbons; and aromatic compounds (at least, I think generally) boil without decomposition at atmospheric pressure. Vertical tars, however, and tars approaching them—containing a more or less proportion of paraffins and unsaturated hydrocarbons of the olefine series—are not so stable; and I would expect them to show some more pronounced tendency to "crack" than the true benzenoid tars under similar conditions.

In this connection it is rather interesting to study the relation of the free carbon in the various tars with the free carbon in the corresponding pitches. Take the three gas tars, the tests of which I have given you, their free carbon content was as follows:

Vertical	1·11 p.ct.,	which	yielded	pitch		40·0 p.ct.
L.T.H.	8·30 ,,	,,	,,	,,		61·4 ,,
H.T.H.	16·35 ,,	,,	,,	,,		66·1 ,,

and assuming no increase in the free carbon in the course of the distillation, these pitches would have contained free carbon as follows:

2·8 p.ct.	but their actual content was	10·0 p.ct.
13·5 ,,		16·4 ,,
24·7 ,,		29·45 ,,

which shows the following increases:

Vertical	7·2 p.ct.
L.T.H.	2·9 ,,
H.T.H.	4·75 ,,

Dividing these increases by the percentage of free carbon in the respective tars, we obtain the rate of increase per unit of original free carbon, equal to:

Vertical	6·48 p.ct.
L.T.H.	0·35 ,,
H.T.H.	0·29 ,,

And taking the "H.T.H." figure as unity, we get the ratio:

Vertical	22·4 p.ct.
L.T.H.	1·2 ,,
H.T.H.	1·0 ,,

In other words, the ratio of increase of the free carbon in the vertical pitch was 22·4, and of the L.T.H. pitch 1·2 times what it was for the high-temperature pitch. The increase in the amount of free carbon as present in the original tar and in the pitch could, of course, only come from a breakdown of some of the hydrocarbons in the course of the distillation; and it seems evident from my figures that tars of a more or less paraffinoid nature are more liable to decomposition than the truly aromatic tars.

Another matter which might be suggested as worth investigation is the actual constituents of the tar acids obtained from tar, with special reference to the relation of carbolic acid to the cresols and any higher tar acids. It is noticed that acids of higher boiling point are present in blast-furnace tar than in distillation tar.

Industrial Applications of Tar and its Products.

The industrial applications of coal tar and its products are wide and varied. Such crude products as refined tar, creosote, and pitch are in everyday use and require no enumeration. The preparation of these is empirical; and it is rather to the more scientific side of the coal-tar chemical industry that interest centres to-day. The coal-tar chemical industry might be roughly grouped as follows: Explosives and dyes, drugs, and fine chemicals—the latter including reagents, perfumes, and photographic chemicals. Coal tar is really the primary raw material of these industries; but of the compounds contained in it, and obtained from it, only a few are employed in the preparation of the various products coming under the different headings. These are benzene, toluene, xylene, naphthalene, anthracene, phenol, and cresol. All these compounds are used in the manufacture of synthetic dyes; but with one or two exceptions they cannot be directly converted into dyestuffs, but have first of all to be converted into what are termed intermediate products. These "intermediates" are obtained by acting on the compounds with sulphuric and nitric acids, and by other means. The chemical reactions involved are comparatively simple, though the processes are perhaps not quite so easy; and, again, the products have to be prepared generally in a high state of purity. The production of dyes from these "intermediates" is brought about by various methods—by chemical interaction with other intermediates or other organic compounds, by introducing other chemical groups, and so on; but it is altogether too complicated to discuss unless one is well conversant with the subject.

The "intermediates" so essential in the dye industry form the raw materials for drugs and fine chemicals; so they are equally essential in these branches. With regard to explosives, the tar products most in demand are phenol, toluene, and cresol, for the conversion by means of nitric acid into picric acid, "T.N.T." and "T.N.C.," respectively. In this connection, the preparation of intermediates (in the same sense) is not necessary; the product of the interaction between the tar product and the acid being the explosive. The products of tar are of great interest and wide utility; so much so that one is tempted to wonder how our forefathers a hundred years ago managed to exist at all. Some of them, too, are most surprising. For instance, who would imagine that such a black messy stuff as coal tar would give us saccharine (three or four hundred times sweeter than sugar), and for which toluene is the starting point.

Coal Tar Prices.

Touching on the present market price of coal tar, it seems anomalous that a material of such considerable value to the nation should be at such a low figure, when almost everything else which one could mention has increased—enormously increased in some cases—as a result of war conditions. It is true that certain of the products of tar—notably benzol, toluol, solvent naphtha, carbolic, and cresylic acids—are in great demand for war purposes and war needs; and it is also true that the prices obtainable for these products, in almost every case, are substantially higher than pre-war level. But then these products only represent from 2 to 3 p.ct. of the crude tar; and, again, a considerable proportion of the values received for them is swallowed up in the much increased cost of manufacture. But you will see if you refer to the test of a tar, and more particularly a heavy tar, that the dominant factor influencing its market value will really be the price obtainable for pitch. With some tars the pitch represents as much as 70 p.ct.; and if the price of pitch falls to 15s. or 16s. per ton—and it has been even lower than this in some parts of the country—the explanation of the low price of crude tar is at once apparent.

Increased Production—The Outlook.

There has been a very large increase in the production of tar, notably in the United States and Canada, in our own country, and no doubt in Germany too. The United States, it is estimated, will by the end of this year have an output from coke-ovens alone of 1,250,000 tons, equal to an increase of about 78 p.ct. since 1915. How this increase in production will affect the price of the product after the war, it would be difficult to say—especially as there is more than one factor to be considered. The war, while stimulating the production of tar, has given a stimulus to the coal-tar chemical industry, which is not confined to this country alone, but is world-wide. We hear of the starting of some dye-factories in Holland, Italy, and Japan—countries which formerly probably never gave it a single thought, but which now recognize with the rest of the world the capital importance of tar and its derivatives, an importance paramount in war, and little less so in peace. Happily, this country is not going to be behind—at least, we will hope not. Certainly we have established the explosives branch on a scale which, I believe, will be second to none; and as for dyes, you well know, no doubt, what is intended. From all accounts undoubted progress has been made with dyes; but, as it is a case of "safety first," explosives have the preference. Besides, even though we had the technical staff and other labour necessary, it would not be possible to develop both branches on a large scale simultaneously, as the chief raw materials for explosives—phenol and toluene, and also nitric and sulphuric acids—are the materials very largely required for dyes.

In the past, crude and semi-refined products of our tar distilleries—such as toluol, carbolic acid, crude anthracene, &c.—have been exported to a large extent. From these, of course, are obtained the products required in explosives manufacture, and for the preparation of the intermediates which lead to dyes. The war has put a stop to the exporting; and surely the pre-war trade will never be resumed. We must make the "intermediates" ourselves. We shall derive the benefit from the labour employed in their manufacture, and in the manufacture of the mineral acids and plant they will require; and, not the least, it will provide an extension of employment for our chemists. If our dye and allied industries should not develop fast enough to take all we can produce, then export what we cannot use, but as "intermediates," not as crude-tar products.

DISCUSSION.

Mr. R. Simpson (Shettleston) said he had some experience of the difference between vertical and horizontal tars. There was in particular one thing to be noted. In vertical tar there was a lot of solid paraffin; and there was also anthracene—it was what one might call a bastard tar. When it came to purification, one thing spoiled the other. Paraffin scale could not be purified with anthracene in it, and anthracene could not be purified with paraffin scale present. The paraffin scale became of no value, as did the anthracene.

Mr. G. H. Sharples (Glasgow) said Mr. Simpson's point had come to his mind when hearing a paper read by Mr. Jones before the Society of Chemical Industry. Why was it, he asked the gas engineers, that vertical retort tar, which in itself was a high-temperature tar, partook of the qualities and the properties of a low-temperature tar? In going round gas-works with vertical retorts, he found the products varying greatly—some turned out benzol, and others turned out benzol with large quantities of paraffins in it. It was for the gas engineers, especially for those who had vertical retorts, to obtain for them decisive conditions. It appeared there were two types of distillation going on. In one zone there was high-temperature distillation going on, in the other low-temperature distillation. Mr. Cross had referred to conditions in which there was a large increase in free carbon. Free carbon was the *bête noire* of the tar distiller. Tar distillation at present was completely on radically wrong lines. The whole thing wanted choking-out and starting again. The stills, for one thing, were too big. There was too much pressure. The tar was subjected to far too fierce heats. Here was a subject for the most thorough investigation. With reference to Mr. Cross's paper, he could not see why producer gas tar and suction gas tar varied. What type of producer was it? Mond gas tar was very watery and fluid. One found evidence of fatty acids. Acetic acid also was very pronounced.

Mr. W. Bennett (Greenock) said that vertical retort conditions differed very much from those of horizontal retorts. The tar, of course, depended on the coal and upon the physical condition of the coal. In the horizontal retort, the gas was too highly heated. In the vertical retort a considerable proportion of the gas passed through the cooler core of the coal charge, and so escaped to a great extent decomposition. In vertical retorts one had a long period of low-temperature carbonization, and only low down in the retort was the gas split-up.

Mr. J. Frazer (Dalmarnock) said the low carbon content of tar from vertical retorts was one of the problems of the tar distillers. There was the difficulty of disposing of their dehydrated tar for roads, because of its low carbon content. They could, by addition, bring it up to specification; but this was hardly honest. A point calling for a great deal of consideration was the extremely large still—for instance, the 30-ton still with the great pressure exerted at its bottom. There was another type of still—the Wilton still—with the inverted bottom; but with this one did not get value for the fuel that was being used. In the plant referred to, they had Wilton's tar dehydrating apparatus, which was very efficient.

Mr. Sharples at this point explained that the form of still mentioned by Mr. Frazer was the concave bottom one, which was in general use in English tar-works. His preference, however, was for the egg-ended type.

Mr. David Fulton (Helensburgh) supported Mr. Bennett's explanation as to the difference between horizontal and vertical retort tar.

Mr. D. T. Marwick (Dawsholm) put forward a plea for greater co-operation between the gas engineers and tar distillers, which was the only means of progress, and asked Mr. Cross if the "C" washing process was doing any good.

Mr. James Dickson (Johnstone) said gas managers generally

seemed to aim at a big gaseous production instead of looking at the ultimate net yield from the coal. At Johnstone, they had lately started tar distillation with a plant similar to that of which Mr. Frazer had spoken. They made 100 million cubic feet of gas per annum; and they were told when they put in the tar-still that it would not pay, and that they should leave the work in the tar distillers' hands. They went on with the scheme, however—being encouraged mainly by a paper read before the Association by Mr. Barr, of Kilmarnock. The results Mr. Barr had given had been borne out in practice. Their success, it must be remarked, was at a time when crude tar was very low in price. Mr. Cross had told them how valuable coal tar was. Yet they were now being paid only 1d. per gallon for crude coal tar. They had taken a good many tests and found that the percentages came out at 5 p.ct. of water, 15 p.ct. of creosote and tar acids, and 8 p.ct. of crude benzol—that was after oil-washing had been carried out to a limited extent.

The President (Mr. G. T. Purves) said it was remarkable that the books published on tar told them nothing about scientific decomposition. Mr. Cross's lecture was therefore all the more valuable. The very interesting experiment made by Mr. Cross in distilling tar with the addition of free carbon—when he got an increase in the fraction boiling at 230° C. and a corresponding decrease in the fraction from 230° to 350° C.—suggested that the free carbon added, probably by raising the boiling point of the residue, had increased decomposition. This confirmed their view that ordinary methods of distilling tar were partially destructive. He could support Mr. Cross's statement that the oxygen content of the coal increased the phenolic content, as he had found that, by increasing slightly the moisture content of the coal being carbonized, there was an increase of phenolic products. This was borne out by the increasing difficulty of getting white salt in direct-recovery practice, notwithstanding efficient tar extraction; the coloration found in the salt being largely due to the oxidation of these phenolic bodies. An increase of moisture certainly reduced the decomposition of the tarry matter; and he had found by this increase a very great reduction in the amount of free carbon formed in the retort.

Mr. Cross, in replying to the discussion, said he believed that Mr. Simpson was quite right in saying that anthracene was destroyed by the presence of solid paraffin, and *vice versâ*. He agreed with what Mr. Sharples said about the need for revolution in the system of distilling. As for the type of producer on which he had been questioned, he did not know it, as he had merely got the sample of the tar. Comparing producer tar with Mond tar, it did not vary very considerably. He did not know what kind of plant the suction-gas tar came from. The products up to 170° smelt very strongly of acetone. Mr. Bennett had said that the course of the gas affected the qualities of the tar; but he (Mr. Cross) did not think the course of the gas had been settled. He was under the impression that the German engineers held that the course of the gas in vertical retorts was mainly through the coal core. In this country they held that it passed between the core and the sides of the retort.

Mr. Purves: Partly both ways.

Mr. Cross, continuing, said that in the M'Laurin tar the coal was distilled by the hot vapours being passed through. Might the same thing not take place in the vertical retort? Replying to Mr. Marwick's remark on the utility of the "C" process, he said that certainly it added to the quantities of the light oils. They bought their tar on the basis of so much per ton of coal carbonized. Since the "C" washing started, they had certainly had less tar.

Retaining Gas Lighting Business.

In the course of a paper read before the annual meeting of the New England Association of Gas Engineers, held at Boston in the early part of February, Mr. J. C. D. Clark advocated the free maintenance of gas-fittings and incandescent burners. There was, he said, an insistent demand for gas lighting some few years ago, and all new buildings were fitted with pipes and fixtures. To-day the demand does not exist. The percentage of new buildings now piped for gas lighting is very small, existing custom is being lost, and if this cannot be retained the prospects of attracting new business are small. In view of the well-known advantages of gas in comparison with other illuminants, such a state of affairs indicates that something is wrong, either with the terms of selling or with the using. The price is right, and it is evident that the trouble is due to want of proper utilization at the burners. The remedy is for the gas company to take charge of the fittings and burners, see that in all cases the full efficiency is secured, and include the expense in the cost of gas. Further, the consumer should receive uniform quality and pressure, the supervision given to mains and services should extend up to the burner, taps should be greased and preserved in good order, and new mantles be supplied as required. Thus it would be possible to hold present customers, attract new business, and re-establish a brisk demand for gas lighting. Experience indicated that a partial maintenance service optional to the consumer would not meet the case. If universal maintenance was adopted, protection would be required against misuse and abuse of the privilege. In a large New Zealand city, where such a plan has been in use for many years, this is afforded by limiting the supply of free mantles to one per 3000 c.ft. of gas consumed.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Preservation of the Standard Rate of Dividend.

Sir,—May I, by your courtesy, indicate a matter which I conceive may be of urgent interest to gas companies at the moment.

By recent announcements of important increases in the price of gas, the bare standard rate of dividend is, in many cases, threatened.

Apart from the diminution of the dividends which, accompanied by a five-shilling income-tax, is a very serious matter, the effect upon the market value of the respective stocks or shares will be lamentable.

The standard price in relation to the sliding-scale has been determined by reference to the selling price as a criterion; and the selling price is arbitrarily controlled by any important changes in the price of raw material and rate of wages.

In regard to all commodities, current prices have been adapted to the changed conditions; and, surely, it is only equitable that the standard price of gas undertakings should be similarly revised to meet, in some degree, the disappearance of the conditions upon which it was calculated.

I do not propose that any relief should be sought as to dividends *above* the standard rates; but I do think that, through the Board of Trade, increases in the standard prices of gas companies—within prescribed limits (say) 10 p.ct.—might be sanctioned so far as may be necessary to preserve the bare standard rate of dividend.

A Committee, or a Tribunal, appointed to this end, might consider the application of each company on its merits, and grant the measure of relief held to be appropriate.

A. M. Paddon.

4, *Brick Court, Middle Temple, E.C.*,
March 15, 1917.

Filling the Fractionating Column of the Debenzolizing Plant at Southport.

Sir,—If you will kindly refer to p. 465 of your issue dated March 6, in the second column, fourth line from the top, it is stated that I use coarse steel filings obtained from a shell-factory for our fractionating column. This should be "coarse steel turnings;" and for the information of your readers who are desirous of erecting a debenzolizing plant, I herewith enclose a drawing [it is here reduced half-size] of the shell-turnings which have been used in the fractionating column of the Southport plant.

Southport, March 15, 1917. John Bond.

A Correction.

Mr. J. H. Brearley, of Longwood, writes that the remarks attributed to him in our report of the proceedings at the recent meeting of the Manchester District Institution of Gas Engineers [*ante*. p. 465] were made by his nephew, Mr. J. W. Brearley, of Swinton.

Intrinsic Brilliancy and Accurate Measurement.

Sir,—In reply to your comment on my letter in your March 13 issue, I wish to disclaim any intention of setting-up my eyes, or those of anyone else, as an accurate instrument for measuring intrinsic brilliancy. Rather would I claim to be one of the "sticklers for accurate scientific measurement," to which you refer. But, just as it is often useful to apply a rough check to an arithmetical computation, to find out if one's figures are reasonably within the mark, so in matters of illumination I think it is sometimes advisable to apply the rough test of the eye. Now if we apply this test, as I suggested in my former letter, to the figures of intrinsic brilliancy which are generally accepted as a measure of comparative dazzle in illuminants, what do we find? That they are wrong, I contend. How far wrong, it is impossible for the eye to judge; but that they are wrong I think you, Sir, would agree if you carried out the test I mentioned.

In your comment I note that you say "surfaces are capable of measurement." How then would you propose to measure the surface of the filament from which a mantle is woven? And if this cannot easily be done, how do you propose to make a fair comparison as regards intrinsic brilliancy between a mantle which you only measure roughly and an electric lamp filament to which you apply a micrometer?

The fact is that the accepted figures of intrinsic brilliancy have not been determined with an accuracy sufficient for the fair comparison of illuminants; and that is one reason, though by no means the only one, why they should not be used for such a comparison.

I regret that I misunderstood your reference to the "stronger definition" of a lamp filament. Your contention that the dark spaces in contrast with the bright filament would make the dazzle greater is certainly in accordance with Dr. Kerr's paper; but I can only say that, in some experiments I have made with different lamp filaments, this effect seems to be more than counterbalanced by the virtual increase in the area of the light source due to spreading-out the filaments.

Undoubtedly, the whole subject requires further investigation; but this is all the more reason for not accepting too readily figures which I have shown to be inaccurate in their basis.

Arthur Cunnington.

26, *Muncaster Road, Clapham Common, S.W.*11,
March 15, 1917.

Directorial Length of Service.

Sir,—The length of service of the gentlemen who were recently re-elected Directors of the York Gas Company [*ante*, p. 526[is certainly remarkable; but it would be interesting to know whether any Board of Directors can show such a record as that of this Company. Mr. J. Okey Taylor, J.P., the senior Director of the Company, was elected a Director of the Reading Union Gas Company in 1855; and on that Company's amalgamation with the Reading Gas Light Company in 1862, he was elected to the Board of the Reading Gas Company, and appointed the Chairman of the Company in 1863—a position he has held since without a break. He has, therefore, served 62 years as a Director, and completed 54 years as Chairman of the Company. The next two senior members of the Board, Mr. T. E. Hewett and Mr. Hugh Hawkins, M.A., have served 29 and 27 years respectively. The service of the present three senior members of the Board therefore totals to 118 years.

The record would have appeared even more noticeable at the end of the past year, as Mr. H. B. Blandy, J.P, who died at the end of December, had been a Director of the Company nearly 54 years and Deputy-Chairman from 1882 until his death.

Mr. Taylor is in his 92nd year, and enjoys excellent health. He continues to preside at the meetings of the Board, and to devote his knowledge and great experience of gas matters and public life in the Company's interest.

A. B. Stedman,
Gas Offices, 159, Friar Street, Secretary, Reading Gas Company.
Reading, March 15, 1917.

Sir,—Your note on the York Directors' "Record" has caught my eye. According to this, the senior Director

has to his credit	37½ years
and two others 34 years each	34 ,,
	34 ,,
	3)105·5 years
Three Directors average	35·16 years

In the case of this Company, we make even a better showing, as follows: Total Directors, 5; the junior with 19 months only to his credit. The remaining four are:

J. G. Thompson (Chairman)	40 years
A. Hutchinson (Vice-Chairman) . . .	36 ,,
F. W. Thompson (Director)	37 ,,
G. W. Shipman ,, ...	32 ,,
	4)145 years
Four Directors average	36·25 years

I expect there will be others to beat us; but after the York statement, I thought it worthy of note.

R. G. Shadbolt.
Gas Office, Grantham, March 16, 1917.

Applications for Patents.

[Extracted from the "Official Journal" for March 14.]

Nos. 3193—3529.

Bawtree, A. E.—"Regulating flow of compressed gases." No. 3296.
Cridland, C. E. T.—"Gas-stoves." No. 3356.
Drägerwerk, H. & B. Dräger.—"Pressure-reducing valves." No. 3248.
Gould, F. J.—"Gas-valve." No. 3306.
Gould, F. J.—"Cup and-ball and shock-absorbing joint." No. 3307.
Hammond, T. C.—"Apparatus for distillation and dehydration of coal tar, oils, &c., and debenzolizing wash, &c., oils and liquids." No. 3196.
Legg, A. S.—See Bawtree. No. 3296.
Mulgrew, J. A.—"Pipe-joints." No. 3197.
Oré, E.—"Manufacture of ammonia or its salts." No. 3399.
Richardson, C. K.—See Hammond. No. 3196.

Horley Gas Company.—In the report for the half year ended Dec. 31, which was adopted at the recent meeting of the Horley District Gas Company, the Directors stated that the profit and loss account showed an available balance of £1237, after providing for fixed charges. They recommended the payment of dividends (less income-tax) at the rates per annum of 5 p.ct. on the preference stock, 4 p.ct. on the "A" capital stock, and £2 16s. p.ct. on the "B" capital stock. This would leave £419 to be carried forward.

Forward Contracts for Coal Supplies.—At a meeting of the Salford Gas Committee on Thursday, consideration was given to the appeal of the Controller of Coal Mines [*ante*, p. 528] regarding the necessity of refraining from making forward contracts for longer periods than three months. It was decided to draw the attention of the Controller to the impracticability and the inadvisability of applying the regulation to gas undertakings. At a meeting of the Manchester Gas Committee the following day, it was decided to support the action of Salford. The matter is referred to in our Editorial columns to-day.

Alliance and Dublin Consumers' Gas Company.—The Directors point out in their report and statement of accounts for the half year ended Dec. 31, that the trading of the Company shows a profit on revenue of £34,194; and that, after providing for interest on debenture stock and temporary loans, there remains £25,853, to which must be added the sum of £3171, balance brought forward, and a credit from the income-tax account amounting to £245—making a total of £29,269. They recommend the declaration of the maximum statutory dividend on the consolidated ordinary stock, at the rate of 5½ p.ct. per annum, less income-tax. This will absorb a sum of £39,767, and will involve the withdrawal of £10,497 from the reserve fund. There will then remain to the credit of the fund the sum of £33,257.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Gas Light and Coke Bill.

The Gas Light and Coke Company's Bill has been referred to the House of Commons Unopposed Bills Committee, consisting of the Chairman of Ways and Means, the Deputy-Chairman, Sir Francis Layland-Barratt, Mr. Turton, and Mr. Moon—to meet on Thursday of this week.

State Control of Coal Mines.

Mr. Duncan Millar asked the Secretary to the Board of Trade what arrangements had been made by the Controller of Mines with regard to the employment and rates of pay of men engaged in the mining industry.

Mr. Roberts replied that no alteration had been made in the existing arrangements.

Mr. Hazleton asked if the Controller was going to take over the Irish mines.

Mr. Roberts replied that he was not aware that there were mines in Ireland to take over.

Mr. Joyce: You have something to learn yet.

Mr. Millar asked what financial arrangements had been entered into by the Controller of Mines with the mine-owners in connection with the taking over of the mines, and how the profits earned under the new scheme would be allocated.

Mr. Roberts was not yet in a position to make a statement.

Mr. Millar: May I ask whether, in point of fact, arrangements have not yet been completed with regard to this matter, and whether statements have appeared in the Press on the subject?

Mr. Roberts: I think statements have appeared in the Press intimating the arrangements which have been made so far.

Mr. Millar inquired what arrangements had been made by the Controller of Mines for the settlement of questions relating to wages and conditions of employment arising between mine owners and their employees while the mines are under State control.

Mr. Roberts: No alteration has been made in the existing arrangements as to wages. The Conciliation Boards in the different districts continue to deal with any questions that may arise with regard thereto.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

Increased Industrial Demands—Effect of Daylight Saving.

The Ordinary General Meeting of the Company was held on Monday of last week—Mr. Wilson Mappin (the Chairman) presiding.

The Chairman, in moving the adoption of the report (particulars of which were given in the "Journal" for the 20th ult., p. 367), said the first paragraph referred to the large increase in the consumption of gas, which was no less than 394,524,000 c.ft., or 7·97 p.ct. over 1915. The increase would have been greater had it not been that very few of the public lamps had been lit during the whole year. The receipts for public lighting were only £1988, as compared with £9001 in 1913, when the price of gas was lower. The excess quantity used was largely accounted for by the demand for furnaces and power. Referring to the Daylight Saving Bill, during the nineteen weeks that it was in force it was estimated that there was a decrease in the consumption of gas in Sheffield of 59,432,000 c.ft., resulting in a saving to the consumers of £5200. There had recently been a good many complaints of poor supply, brought about by the Company having had to reduce very considerably the pressures in order to avoid having a complete failure, which would undoubtedly have taken place had the pressures not been so reduced. The reason for the Company being in this position was the difficulty of obtaining a sufficient number of men suitable for the work required to be done. All last summer they were endeavouring to obtain men from the Ministry of Munitions. The Managing-Director made numerous calls at the Labour Supply Department of the Ministry; and the only aid they gave the Company was to send a military working party of 150 men. These men, unfortunately, had not been found equal to the work they had to perform. After these men had arrived, they still pressed the Ministry for additional assistance; but no further men were supplied. The Managing-Director pointed out what the result would be if the supply of gas were not fully maintained, and the effect it would have upon the output of munitions. The position, moreover, had been aggravated since the beginning of the year by the long spell of cold weather. When he told them that they had had retorts heated up for weeks without men to charge them, they would recognize that the Company had done all in their power to meet the necessities of their consumers; and it has been a source of great worry, both to the Board and the officials, that they had not been in a position to do so. Notwithstanding the curtailment to which he referred, the quantity of gas sold in January and February was 1,212,395,000 c.ft.—an increase of 130,348,000 c.ft. over the same two months of last year. During the last session of Parliament the Government passed an Act authorizing the Board of Trade to substitute a calorific standard for the illuminating standard by which gas had hitherto been tested. The Company, regarding this as the desire of the Governmant that the new standard should be fixed, made the necessary application in order to effect this object. But, unfortunately, the Corporation thought fit to oppose the Company at an inquiry that was held by the Board of Trade. The result, however, was the fixing of the standard of 500 B.Th.U., which figure was adopted by Parliament in numerous cases during

the last few years. The Company regarded this as a minimum or penalty point; and, as soon as ever they were in a position to do so, they intended to supply gas of as good a quality as they did prior to the war. One serious result of having to extract toluol and benzol for the High Explosives Committee had been the deposit of naphthalene in the pipes. During last year they had to deal with 34,337 complaints. For the week ended Dec. 16 they reached as high a figure as 2548. This had naturally caused a good deal of discontent among their customers, many of whom had put down the deficiency in the quantity of gas they received to poor quality. The difficulty had been aggravated by the fact that the Company had not been able to attend to these complaints as promptly as they should have wished to do, owing to the shortage of men. They had expended £122,601 more for coal than in the previous year, purifying had cost £630 more, stokers' wages £6641 more, repairs of works £9334 more, repairing meters and stoves £563 more, rates and taxes £9236 more—including £9288 for income-tax, the difference between the sum paid on the profits in 1915 and the amount deducted from the shareholders' dividends. Repairs of mains and services showed a reduction of £1889; the Company having done as little work in this direction as possible, owing to the high cost of materials and to their requiring the men inside the works. On the other side of the accounts, the receipts for gas showed an increase of £81,801, meter and stove rents £796, coke £63,851, sulphate of ammonia £2782, while there was a decrease in tar of £2846; the net result being that, after paying the dividend, there was a surplus on the year's working of £21,224. The demand for gas for work in connection with munitions continued to increase—151 furnaces, of the value of £10,113, and consuming gas at the rate of 133,350 c.ft per hour, having been fixed by the Company during the year. This was in addition to apparatus supplied by any outside firms. A further fifty gas-engines were fixed, of a total of 1664 H.P. The gas consumed by engines during the period under review was 897,154,000 c.ft. The total number of meters fixed at Dec. 31 was 109,172, an increase of 1045, including six for 2000 lights each. For some few Sundays past a number of the Company's officials had again voluntarily gone to the works to assist in coke loading, &c.; and he took the opportunity of expressing the thanks of the Board for the assistance they had given. The Company's Bill, which was authorized at the special meeting of the shareholders on Jan. 29, had passed the second reading in the House of Commons.

The report was adopted; and dividends were declared of 5 p.ct. on the "A," "B," and "C" stocks for the half year ended Dec. 31.

LEA BRIDGE DISTRICT GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Tuesday last, at the Offices, Nos. 63 and 64, Chancery Lane, W.C.—Mr. A. M. PADDON, M.Inst.C.E. (the Chairman), presiding.

The SECRETARY (Mr. Richard Sandell) having read the notice convening the meeting,

The CHAIRMAN proceeded to move the adoption of the report and accounts for the six months ended Dec. 31. They were, he said, very satisfactory in character. There had been a gratifying increase in the business; and during the current six months this increase was being largely exceeded, so that the expansion shown in the present accounts was of by no means a temporary nature. In the capital account, the expenditure during the period under review had been £3970. When the war came along, it found the Company engaged in the development and extension of their works; and this duty could not be laid aside. However, as an off-set to the expenditure, there had been written-off £2679 for depreciation of gasholders, meters, and stoves. The capital expended was about £572 per million cubic feet of gas sold, which, for the size of the undertaking, was satisfactory. Turning to the revenue account, raw materials had cost more to the extent of between 7d. and 8d. per 1000 c.ft. of gas. The Company had spent on war bonus to the employees, to meet the increased cost of living, £760; and this, with the payments to dependants of men on service, £414, represented considerably over 1d. per 1000 c.ft. of gas. On the other side, the sale of gas and rental of meters and stoves brought in an increase of £4421, and residuals an additional sum of £2721; the total receipts being £7143 up. But the expenditure was £6771 more; the profit being therefore £372 greater. The profit for the half year, with interest on bankers' deposit, was sufficient to pay the dividends, and leave a surplus of £8. They might congratulate themselves that they had been able to pass through nearly three years of war without having to touch the reserve, which was provided essentially for such times. The eminently satisfactory character of the statement now submitted was established mainly by two causes—the gratifying increase in business, and the fact that the undertaking was carried on in a locality which had perhaps less than any other in the South of England been affected by the war. The supplies of coal had been practically uninterfered with. Although, no doubt, there were many difficulties yet to come, he could not at the present time see that, as regarded their Company, there was anything to cause the proprietors very profound perturbation. The coal contracts had been renewed; and though oil was very dear, they would have far less recourse to it in the future than had been the case in the past. The business so far in the present half year had increased to such an extent as to ensure a gain over the complete period. With the termination of the war, there would be very material changes in the character of the gas business; and the processes they had adopted for carrying out their work would be such as to fall in with the demands that might be expected to be made on the industry in the near future. It seemed to him, therefore, that they might feel reasonably confident with regard to the future.

Mr. G. W. CAREY formally seconded the motion.

Mr. E. L. BURTON congratulated the Board and the Engineer on the excellent results shown; the sale of gas having been over 6 p.ct. more than in the corresponding half of the previous year. In fact, the results were, he said, among the best he had seen for an undertaking situated like the Lea Bridge Company.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. J. M. MILES, dividends were declared, less income-tax, at the rates per annum of 5 p.ct. on the preference stock and 6½ p.ct. on the ordinary stock.

The retiring Director (Mr. G. W. Carey) and Auditor (Mr. Thomas Maskall) were thereafter re-elected.

The CHAIRMAN, proposing a vote of thanks to the officers, remarked that nearly all he had already said was a direct or indirect tribute to the efficiency with which they had been served by their executive officers. The results which Mr. F. W. Cross (the Engineer and General Manager) had furnished were, in all the circumstances, very satisfactory; and they were going to be better still in the future. The prosperity which the Company now enjoyed was very largely due to the 22 years' work which Mr. Cross had put in as Engineer.

Mr. CROSS, in acknowledging the vote, said he had a number of officers and men under him whom he had to thank for their help,

The Directors were also thanked for their services, on the proposition of Mr. JOSEPH CASH.

JOHN WRIGHT AND EAGLE RANGE, LTD.
(BIRMINGHAM AND LONDON).

Mr. H. JAMES YATES, the Chairman and Managing-Director, presiding at the annual meeting of the Company at Birmingham on the 14th inst., said the war had rendered extremely urgent the great problem of establishing a better understanding between employers and employed. Fortunately, there was a new spirit stirring among both classes of the industrial community, which there was reason to hope would lead to mutual confidence based on equitable conditions. Both sides were coming to recognize two essentials—there must be the removal of all artificial restrictions upon maximum output. Though abnormal rates of pay due to the war obviously could not continue in time of peace, yet there must be adequate remuneration to workers, so as to ensure to them, not only the comforts of life, but, what was more important, a proper degree of security with regard to their future. It was equally important to a mutual understanding between capital and labour that means must be taken to ensure that bargains between Employers' Associations and Trades Unions should be honourably carried out by both sides.

FEDERATION OF BRITISH INDUSTRIES.

Referring to the Federation of British Industries which was formed last year, and speaking as a member of its Executive, he expressed his confidence that the Federation would do valuable service in cultivating a good understanding between capital and labour, so as to avoid industrial warfare; in the promotion of co-operation among manufacturers and producers for the development of their business interests; in facilitating interchange of views with Governments, public bodies, &c., all over the world; and in the control of commercial legislation in the interests of industry. Already the membership included the largest firms in the country, and represented, approximately, a capital of £2,000,000,000. On its Executive were many of the leading captains of industry; and no industrial movement of recent times was more full of promise. The annual subscription was only £100; and everyone controlling industrial businesses should regard it as a duty to join. The Federation had invited numerous representative firms to express their views as to how the community should deal with the great and delicate fiscal questions with which they were faced owing to the war. The Federation had expressed no views as a body on these matters, but had presented in a tabulated form to the Government the individual answers that had been received, in order to assist them in reaching a settlement.

AFTER THE WAR.

The war had called into existence new works, buildings, and plant to an extent never paralleled in the history of our industries. Manufacturers must be more ready in future to exchange useful results of their experience, and see to it that when this equipment was no longer needed for war purposes it should be utilized to the utmost for making the nation's output larger and better than ever before. It was to be hoped that the establishment of a Ministry of Commerce would not be delayed, as commercial problems were second only in importance (and that merely for a time) to military interests. Immediately the war was over, a most critical time would follow. When this arrived, we could not be too vigilant; and any tendency towards making permanent a general bureaucracy must be strenuously resisted, or we should only be beginning where Germany leaves off. Officialism was an insidious, soulless, mechanical thing, which in normal times would undermine the nation's freedom. Officials created officials. Like microbes, they were of a high order of reproductivity; and while we endured them for the present, we must keep a great reserve of the proper antitoxin to deal with them once the present conditions were over. Another grave danger to our commerce and our liberties at the close of the war would be any serious weakening of our parliamentary institutions. Parliament might often be a "talking shop;" but it was the one effective court of appeal for commercial men against unreasonable dictation on the part of officialism. At the same time, in his own experience, the war had led to many splendid men being "discovered" who were doing magnificent service to the country as officials.

NEED OF THE METRICAL SYSTEM.

The need of the metrical system in this country was never so clamant as now. Instead of waiting for dilatory legislation, let every merchant and manufacturer in the country make an immediate start by having all dimensions and weights in his next catalogues expressed in the decimal system, as well as by the present method. This would gradually familiarize people with the new system. It was also essential that catalogues should be in the customer's own language, and that prices should include delivery in their own country.

THE COMPANY'S BUSINESS.

The Company's own particular business continued in a very healthy state. Their furnace and industrial apparatus business had grown beyond the most sanguine expectations. Taking advantage of opportunities of dealing with practical industrial problems which, but for the war, the conservative English manufacturer would never have

given, the Company had been enabled to give the manufacturer a greatly increased output per man, reduced working costs, and uniformity of results such as he had never dreamt of when using the older types of furnaces. It would be a revelation to most people to know the important part the gas-furnace had played in the war; and by far the greater part of this pioneer work had been done by the Company. One of the directions in which they had specialized was the gas crucible metal-melting furnace. Not so long ago, even the lowest grade of brass could not be dealt with on a commercial basis in gas-furnaces; to-day cupro-nickel, pure nickel, and even platinum, were being melted and heat-treated in other ways in the Company's furnaces with such ease and at so low cost that they were being adopted in all quarters.

TACKLING THE CRUCIBLE FURNACE BUSINESS.

One very important fresh development in connection with their furnace business was now being completed. Their own Company and the well-known Morgan Crucible Company, Ltd., of Battersea, were the only two firms who had proved themselves able successfully to tackle the crucible furnace business. By the new arrangement, the very large business of the Morgan Crucible Company in furnaces would be taken over by the Company, who would become the sole manufacturers of all furnaces sold by the Morgan Company; and the patents of the two Companies would be combined in all crucible furnaces made by the Company—these being named in future the "Wright-Morgan" furnaces. This co-operation between the two leading firms in the furnace business, and the directing of both Companies' technical and commercial resources to one common end, could not fail to produce highly successful results.

THE THERMO-X INJECTOR VENTILATING FIRE.

The Company's "Thermo-X" "Injector-Ventilating" silent gas-fire still stood in un unrivalled position. It had all the comforts and virtues of the coal-fire, with none of its disadvantages. It ventilated a room equally well; and its entire silence in burning was a very great comfort. For any who preferred to retain the cheerful old coal-fire, the Company's "Eagle" grate had peculiar advantages.

THE FINANCIAL POSITION.

The new issue of shares authorized last December had now been carried through; the amount being £128,640, of which £67,000 had been taken from the published reserves, and the remainder from the internal reserves. Out of the authorized capital of £750,000, the issued capital was £428,040. There were no debentures whatever.

After allowing for depreciation, the investments, with the additions made from time to time, stood at £121,000. This included the subsidiary businesses belonging to the Company, taken at figures which by no means represented their full value to the Company.

RICHMOND GAS STOVE AND METER COMPANY, LIMITED.

Annual Meeting.

The Twenty-Sixth Annual General Meeting of the shareholders of the Company was held at the Offices, Academy Street, Warrington, last Thursday week. Mr. Thomas Dwerryhouse (Chairman of the Board of Directors) presided, and other Directors present were: Messrs. Horace M. Thornton (Vice-Chairman and Managing-Director), J. W. Slack (Managing-Director), John Coxon, and J. F. Atkins, M.B. Also Mr. Arthur Slack (Secretary).

Report of the Directors.

The following report of the Directors was presented: The Directors have pleasure in submitting to the shareholders the balance-sheet of the Company for the year ended Dec. 31, 1916. The balance standing to the credit of the profit and loss account (less debenture interest), including the amount brought forward, is £34,943 10s., which the Directors recommend be appropriated as follows: Depreciation on buildings, plant, patterns, fixtures, &c., £7421 17s. 8d.; dividend on preference shares at the rate of 6 p.ct. per annum (less income-tax), £4840 19s. 7d.; dividend on ordinary shares at the rate of 10 p.ct. per annum (free of income-tax), £8161 12s.; bonus of 6d. per share on the ordinary shares, £2040 8s.; dividend on the new preference shares and dividend and bonus on the new ordinary shares, £560 14s. 8d.; and reserve fund (bringing this amount up to £65,000), £5000—£28,025 11s. 11d. Balance to next account, subject to the Directors' remuneration, £6917 18s. 1d.

The Chairman, in moving the adoption of the report, said: When we held our meeting here this time last year, many of us no doubt thought that in another year the war would be ended, our troubles over, and our trade going on as usual—perhaps better than usual. The conflict, however, is still going on; and business people are still feeling the heavy and increased strain which it was hoped would soon be removed. Our Company, among others, has felt the burden of responsibility very much. He then proceeded to a detailed explanation of the accounts, and concluded by saying he thought it was a very good balance-sheet. He did not think it could be much better; and if they had as good a one next year, he would be satisfied in the existing circumstances. [Applause.] He proposed—"That the Directors' report and statement of accounts for the year ended Dec. 31, 1916, as certified by the Auditor, be received and adopted."

Mr. H. M. Thornton on the Company's Progress.

Mr. Horace M. Thornton (Vice-Chairman), in seconding, said: The balance-sheet and report before you is the twenty-sixth the Company has presented to its shareholders. It shows continued progress of the business, and a further strengthening of its already strong financial position. The year 1916 will always be remembered as the most difficult in our history, as it doubtless has been for many other companies. The war has made great changes for us. We have had to reorganize ourselves for war demands; and though we had in 1915 made special preparation for this, the year now closed has required the utmost skill and attention to bring our business into line with present-day requirements. We have had difficulties in getting materials; we have had to pay high prices for them. Numbers of men have joined the army during the year, although in the early days of the war a very large percentage of our employees of military age willingly offered their services to the country.

APPARATUS FOR INDUSTRIAL USES.

The outstanding features of our trading have been the growth and development of the apparatus we manufacture for industrial uses. Our furnace department has continued to develop in every direction. Not only has the output largely increased, but the diversity of operations for which we construct furnaces has enormously multiplied. The war has produced some remarkable changes in all engineering trades; and the energy, skill, and adaptability of the British manufacturer have been demonstrated in a very convincing manner. In this development our furnace department has had its part. Uses hitherto unknown, uses hitherto regarded as impossible, have been d scovered, and gas successfully applied. There are very few heat treatment operations to-day which gas-furnaces cannot efficiently and economically undertake. This has been of special value to the nation; and it is certain that Richmond's gas-furnaces have materially contributed to the output of munitions and armaments of all kinds. Gas-furnaces possess peculiar advantages which have rendered them indispensable in many munition works. They save valuable space in factories, permitting of a greater output per cubic foot of factory. They can be installed almost anywhere, and require little or no reconstruction of factory; while the fuel they consume is nearly always available and of fixed calorific value. These advantages, important in peace time, are accentuated by the special conditions under which the industry is being carried on to-day.

FOOD FOR MUNITION WORKERS.

Reference must also be made to our department for supplying large cooking apparatus. The progressive movement—largely the result of the initiation and example of the Ministry of Munitions—for the installation of industrial canteens, will be known to you. This movement has grown to a remarkable extent during the year under review; and our resources have been strained to meet the demand. In all quarters of the country our apparatus is to be found, providing well-cooked food, and thus assisting to maintain the efficiency of the workers at the high level demanded, if the output necessary to the country's requirements is to be continued. Not only canteens, but military hospitals, Y.M.C.A. centres, and many other organizations have required our kitchen apparatus; and we are glad to feel that in thus another direction our industry has proved of value to the nation.

PROBLEM OF DOMESTIC LABOUR.

Our normal business of domestic cookers and fires has, naturally, been subordinated to a large extent to these special war-time activities; but it should not be forgotten that a steady output of these articles is essential if the gas-works of this country are to continue and increase their supplies of the invaluable bye-products of gas manufacture which the Ministry of Munitions and other Government departments are urgently demanding. The gas undertakings of this country are responding magnificently to the request for larger and ever-increasing supplies of these indispensable products; but they recognize they require from us the necessary apparatus in which the increased supplies of gas may be consumed, and the parts necessary for the renewal and maintenance of existing apparatus. Gas-cookers, gas water-heaters, and gas-fires are solving the problem of domestic labour, and releasing female labour for munition work; and they have proved to be of great value to the working classes, particularly since the scarcity of coal and the difficulty of cartage and delivery. Shareholders will also be gratified to know that our associated companies are also doing their part in the national interests. Surveying, therefore, the field of our operations during the year under review, we can see that our Company continues at an increasing rate to devote its time and its output to the war requirements of the nation. The future, no doubt, will be still more difficult than the past; but the problems we have already faced and overcome give us strong confidence that we can meet them with every hope of success; and I am satisfied that the experience we have gained, and the developments we have made in the departments I have outlined, will be of the utmost value to the Company when peace returns. [Applause.]

The proposition was carried unanimously.

Thanks to Managing Directors and Staff.

Dr. J. F. Atkins (Director) proposed—"That the thanks of the share holders be, and they are hereby, tendered to the Managing Directors, Secretary, and staff for their efficient services during the past year."

Firm's Relations with Employees.

Mr. James W. Slack (Managing Director), in response to the vote of thanks to the staff, said that for fourteen years he had—except perhaps on one memorable occasion—been content to let his presence be seen without making his voice heard, because he had held the view that it was the duty of the Secretary to work and not to talk. Now that he had been put into a different position, it was his duty to respond to the comprehensive vote of thanks. On behalf of Mr. Thornton and himself, and the rest of the staff, he thanked the shareholders very much for their confidence in them. They were going to do their best during the coming year; and they were going to try to show a greater profit. They had, however, so many difficulties to contend with that the shareholders must not be disappointed if it was not so good. The Directors had been good enough to ask him to fill up the place which no one regretted more than he had become vacant through the resignation of Mr. Ransome. He did it with a certain amount of misgiving, because he had been so comfortable in the position of Secretary, and was getting on so nicely, that he did not feel he wanted to be disturbed. He could not, however, refuse the offer of the Directors; and therefore he took on the work. Since Jan. 1 he had learnt a great deal. Perhaps one sometimes had feelings towards a managing-director which one could not express in words; but he could now assure them that any works managing-director had his

sympathy. [Laughter.] He found it was not altogether a bed of roses. The trials and difficulties with labour must have been particularly emphasized, he thought, during the past two months; and a good portion of his time had been occupied in interviewing, not only representatives of the men, but the men themselves. He thought very early on in his management that one of the best things he could do was to get the representatives of the various shops in the works and look at them face to face, and have a straight talk with them. He did so, and found that there was a decidedly better feeling in the works to-day than there had been perhaps for some time past. The men had their difficulties, as well as the employers; and he had a great deal of sympathy with the men. He thought that perhaps the more employers and managers studied the troubles and difficulties of the men, the better it would be, not only for the men, but for themselves. So he hoped to adopt a principle of give-and-take, and felt sure the men would do the same. While he made concessions on the one hand, he quite expected and believed that the men would be prepared to meet him from their point of view. They had their rights and privileges just as the employers had; and if both sides acknowledged this, he was sure they would get on very well.

BENZOL AFTER THE WAR.

In view of the importance which attaches to the question of the best use to be made of the country's supplies of benzol after the war, the following reference to the subject [to which allusion has been made already in the "JOURNAL" pages] may be quoted from the speech of Mr. M. S. Sharp, the Chairman at the Bradford Dyers' Association, Ltd., at the recent meeting of shareholders.

There is one point vitally important to the future prosperity of the aniline dye industry, which I hope may receive the immediate and special attention of the Government. That is, the need of securing for it the most ample supply of benzol at a price which will enable colours to be manufactured as cheaply as in Germany. Benzol, which, as you will know, is distilled from coal in the process of making coke, is one of the most important of the raw materials from which dyes and high explosives are made; and its production in Germany during the last ten years has increased by leaps and bounds—doubtless mainly in view of its use in war, just as their enormous extensions of acid plants in the years immediately preceding the war were made with the same object. When I was in Germany immediately before the outbreak of war, I gathered that benzol was supplied to the colour makers by the Cartel controlling it—in which the colour makers are, I believe, largely interested—at about the cost of production; the Cartel making its profits by the sale of the balance for motor traction.

One danger facing the aniline colour industry in this country lies in the possibility—nay, rather, the probability—that the great petrol companies, who have an aggregate capital of over £200,000,000 (nearly one-half of which is held by British companies), may buy up the whole or the greater part of the benzol produced in this country, in order to prevent or control its competition with petrol. They could well afford to do so at a price which would make it quite prohibitive for colour making. To-day benzol is absolutely controlled by the Government; and I submit that, in the national interest, such control should not be relinquished before the fullest safeguards to the dye-making industry have been firmly established. Without delay some authority should be set up to closely study and report upon the various methods by which we are producing benzol under pressure of war demands, with the view of determining authoritatively which is the best.

A year ago I called your attention to the fact that we were hopelessly behind Germany in regard to this. But, important though it is, it is only a small part of an immensely greater subject—namely, the scientific treatment of the whole of our coal. It has been publicly declared by eminent scientists that this country might save £100,000,000 a year, and secure a smokeless England, by so doing; and they have adduced very striking and convincing arguments in support of such opinion. In the days after the war, if we are wise, we shall make use of scientific knowledge to a much greater extent than in the past; and it is surely most necessary when the first and paramount consideration will be how to make good the wastage of the war, that such an immense potential national economy should not be disregarded. The establishment of the Board of Fuel Research which has just been announced, consisting as it does of most distinguished scientists, shows that the Government is fully alive to the importance of this; and probably its terms of reference will be sufficiently wide to cover the special point I have raised.

FERTILIZERS AND THEIR SUPPLY IN WAR TIME.

Dealing with this subject in a paper before the Royal Society of Arts last Wednesday, Dr. J. A. VOELCKER, speaking of sulphate of ammonia, said it was a question of the highest moment that the sulphate of ammonia produced in this country should be retained, as far as our requirements go, strictly for use here.

Until recently, when, on Jan. 19, the export of sulphate of ammonia was prohibited altogether, the question of export had been a "burning" one between traders and agriculturists. The removal of competition in prices with nitrate of soda and the shortened supplies no doubt offered favourable inducements to export, and to this was added the advantage that in this way the stock could be immediately disposed of and the money obtained and so kept in busy circulation. On the other hand, agriculturists and manure manufacturers urgently required it; and ultimately, in August, 1916, the Board of Agriculture arranged with the Sulphate of Ammonia Association that farmers could obtain sulphate of ammonia until the end of September at a price of £15 per ton for immediate removal, the price for the 1916-17 season being £15 10s. per ton. It would appear that previous to this farmers had not sufficiently availed themselves of laying in their needed supplies. For this, there were several reasons. For instance, a farmer seldom had the facilities for storing any considerable quantity of manure, and did not care to order it long before he knew exactly what his requirements would be. Added to this was the expectation that prices would be more favourable.

These two sets of conditions, as affecting the traders on the one hand and the farmers on the other, acted favourably to the desire for export; and it was to be noted that the total exports for July to December, 1916, were only 2900 tons less than in the corresponding period of 1915. Along with this was the significant fact that while the exports to Spain, Holland, Java, the West Indies, Japan, and the United States were less in 1916 than in 1915, and naturally more to France, there was an increased export in 1916 of 12,500 tons to "other countries" (this meaning Scandinavia, and mainly Norway), over that of either 1915 or 1914. It was impossible to resist drawing the conclusion that a not inconsiderable amount of sulphate of ammonia produced in this country found its way during 1916 to countries where it should not have gone, and, further, that in the production of this a great amount of sulphuric acid was being used at a time when the manure manufacturers were not able to retain enough of it to make superphosphate for the farmers' needs. While having a certain sympathy with the maker of sulphate of ammonia in that, by export, he turned his money and did not have to store his goods, whereas if he sold to the farmer the latter would want him to keep it for him until he was ready to use it, nevertheless, in these days one ought to be patriotic, and it was not right that the only available nitrogenous manure should be sent out of the country, more especially if it had been made by using the acid of which the manure manufacturer was deprived.

Now, however, by the Order of Jan. 19 last, this had been put right by the export being prohibited altogether, and the price fixed as mentioned above. While, however, expressing satisfaction at this, he did not think it would be unreasonable to call on the farmer to state by a certain date what his probable requirements would be, and to ensure that sufficient stock be kept over to meet these. A further matter that had been pointed out to him was that the concession to the manure manufacturer to buy sulphate of ammonia at the works for 10s. per ton less—viz., £15 10s.—was hardly sufficiently liberal to recoup him for the extra cost of handling, storing, &c.

The use of nitre cake by superphosphate makers had been urged by the Board of Agriculture. This cake contained about 30 p.ct. of free sulphuric acid, together with variable quantities of nitric acid compounds. The free acid, it had been suggested, might be utilized to replace, or at least to supplement, the acid available for dissolving use. Why should this not also have been urged upon makers of sulphate of ammonia where the product was to be used as a fertilizer? He could understand why it should not be employed where the making of munitions was concerned; but there was no absolute need for a farmer to have a 24 or 25 p.ct. ammonium sulphate. A much lower quality would do quite well, and the presence of the sulphate of soda would not constitute a bar. He was aware that there would be difficulties with this, but probably not greater ones than exist in making superphosphate with nitre cake. If necessary, the salt could be purified by re-crystallization. He had examined samples of sulphate of ammonia thus made and containing over 24 p.ct. of ammonia.

Referring to the shortage of sulphuric acid owing to the Government requirements, and the consequent serious effect upon the production of artificial fertilizers, Dr. Voelcker said that arrangements had been made by which not only will it be possible for the Government to set free a larger quantity of sulphuric acid for fertilizer manufacture, but also to provide for the import of more phosphatic material.

Dr. B. DYER, in the course of the discussion which followed, agreed that there would be no disadvantage in making sulphate of ammonia by means of nitre cake from the point of view of having the sulphate of a lower grade, except that there was the question of carriage. On the other hand, from the point of view of the effect on the soil, he was not sure that good would be done, because experiments made many ago, and confirmed since, showed that soda salts had a very considerable fertilizing influence upon the soil, and these were provided by the use of nitre cake.

Mr. W. E. OAKDEN asked whether it was not possible for sulphate of ammonia to be produced in gas-works without the use of sulphuric acid, so that the acid thus saved could be utilized for the purpose of producing superphosphates.

Dr. VOELCKER, in his reply, said he should assert that this could not be done. Even if hydrochloric acid were used, it was expensive, and, in its turn, required sulphuric acid.

PROPOSED SHARING IN WAR PROFITS BY CHICAGO GAS CONSUMERS.

For some time past negotiations have been pending between the City Council of Chicago and the People's Gas Company; and a proposal put forward by Mr. Bemis, the special expert retained by the city authorities, is remarkable as a new project in gas finance, and, incidentally, as an illustration of the enormous "war profits" that are being obtained by American gas undertakings. Mr. Bemis estimates that these may be stated as over $800,000 during the year 1917 for the People's Gas Company alone.

The existing standards under which gas is being supplied in Chicago are a price of 80 c. per 1000 c.ft., of 22 c.p., and 600 B.Th.U. In place of this, a rate of 75 c., less 5 c. discount for prompt payment, is now suggested, with a sliding-scale minimum charge commencing at 25 c. per month for 3-lt. and 5-lt. meters, but subject to a return of any excess above the minimum that may be paid in respect to any succeeding bill within sixty days after the payment of such minimum charge; also that two-thirds of the profits on the People's Gas Company's project for washing benzol and other munitions material out of the gas shall be divided among the consumers by quarterly instalments, which would represent a further reduction in the price of gas to the extent of 3 c. or 4 c. per 1000 c.ft. For gas in excess of 10,000 c.ft. a month, the Company may charge the net cost into the holder *plus* 20 c. to cover interest and distribution costs, and a profit that will ultimately enable gas to be sold at a lower price to the small consumers.

The Lighting Committee of the City Council adopted the proposition by 7 votes to 3. The Gas Company had asked that the State utilities standard, which does not include a candle power standard, should be adopted; and Mr. W. G. Woolfolk, the Engineer representing the Gas Company, protested against the inclusion of any candle power. It is doubtful if the Gas Company will accept.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 19.

The position of London pitch continues to improve. It is reported that 27s. net per ton f.o.b. makers' works has been paid for export, and a higher price is now asked. Anthracene is in considerable demand, and the value is rising materially. It is believed that over 5d. per unit for "A" quality is obtainable for forward delivery. Other products are unchanged; creosote having been repeated at 4½d. net per gallon in bulk at makers' works.

Sulphate of ammonia remains in keen request for early delivery on the basis of the official price for home agriculture. The export is still prohibited.

Tar Products in the Provinces.

March 19.

There is nothing fresh to report concerning the markets for tar products. Business in pitch is difficult, owing to the freight question. Creosote is steady. Naphthas are quiet.

The average values of gas-works products during the week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¼d. to 6½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3½d. to 3⅝d. Heavy oils, in bulk, North, 3⅝d. to 4d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1½d. to 2d.

Sulphate of Ammonia in the Provinces.

Liverpool, *March* 17.

There is no new feature to comment upon in the situation of this material; export business being still in abeyance. The prices for home agricultural purposes are unchanged at £16 per ton direct to farmers and £15 10s. to manure manufacturers and local dealers, net cash in makers' bags at consumers' station in the United Kingdom.

Nitrate of Soda.

The market is steady; but no further advance has taken place, and quotations are repeated at 24s. per cwt. for ordinary quality, and 24s. 3d. for refined, on spot.

COAL TRADE REPORT.

Northern Coal Trade.

There is rather a better demand for coals; and, with slightly fuller arrivals of steamers, the foreign part of the trade is somewhat more promising. But supplies are ample, as some of the pits have worked short time for lack of ready steamers. In the steam coal trade, best Northumbrians are about 30s. per ton f.o b.; second-class steams are 21s. to 22s.; and steam smalls are in ample supply at from 17s. to 19s. 6d. Work at the collieries was a little fuller last week; but lack of prompt tonnage impedes the trade. In gas coal the demand is brisk; the needs of home users to replenish their stocks being general and the shipments increasing. Best Durham gas coals are 25s. per ton f.o.b.; second-class qualities are about 17s. to 19s. 6d.; and "Wear specials" are from 29s. to 31s. Freight on gas coals seems firm; orders being numerous for overseas ports, and tonnage on offer still only limited. New contracts are few as yet, though sales of casual cargoes are more frequent; and it is probable that some heavy contracts for gas coal must soon be put on the market, though for shorter periods than last year—at least, this condition is hinted at by the colliery controllers, The work at the gas coal pits is full for the season, and promises well, if only steamers were more plentiful. Gas coke is steady, and the price is from 31s. to 32s. 6d. per ton f.o.b. in the Tyne. The freight on coke is firm at about 45s. Tyne to the northern ports of France.

Dublin Gas Prices.—An increase of 6d. per 1000 c.ft. is announced in the price of gas by the Alliance and Dublin Gas Company; the new price to become operative as from the beginning of the March quarter. The old price was 3s. 6d. in the city and suburbs, and 3s. 9d. in the out-districts; so that the new prices are 4s. and 4s. 3d. respectively.

Lichfield Gas Company.—In the course of his remarks to the shareholders at the annual meeting, the Chairman (Alderman H. M. Morgan, J.P.) said he regretted that he could not report any improvement in the Company's business during 1916. As a matter of fact, 17 p.ct. less gas had been sold than in 1915, which meant a considerably decreased income; and owing to the greatly increased cost of everything, the expenditure had almost been the same in the two years. In common with most other small gas companies, they were experiencing decreased business owing to the existing conditions caused by the war. Indeed, it was remarkable that they had done even as well as they had, considering the depleted staff they were left with after the requirements of the military authorities had been met. The mechanical stoking machine, which was contemplated at the last annual meeting, had recently been installed, and was working satisfactorily. This they hoped would enable them to tide over the present labour shortage. As all present were well aware, the country's needs must come first; and the Directors felt that the Company had done everything possible in this respect, and at the same time had endeavoured to carry on the business to the best of their ability.

We were the pioneers of **EFFICIENCY** in Gas Radiants.

Our **"THERMO-X"**
RADIANT has all along held, and still holds, the premier position for
= EFFICIENCY =
And that efficiency is accompanied by a degree of
STRENGTH
that we have not found equalled in any other radiant

JOHN WRIGHT & CO.,
Essex Works, BIRMINGHAM.

Progress of the Bristol Gas Company.

Referring to the fact that, as already intimated in the pages of the "JOURNAL," Mr. John Phillips is resigning his position as Secretary of the Bristol Gas Company—while, however, remaining a Director—the "Bristol Times and Mirror" quotes some figures to show the enormous progress that Mr. Phillips has seen the undertaking make during his 57 years' connection with it. Going back to 1862, the expended capital stood at £255,000, the Company carbonized 48,000 tons of coal, and made 389 million cubic feet of gas, which they distributed at 3s. 9d. per 1000 c.ft. through 108 miles of mains. The concern continued to grow decade by decade until, in 1902, the capital expended had gone up to £1,158,814, the reserve fund had grown to £106,000, as many as 239,650 tons of coal were carbonized, 2285 million cubic feet of gas were made, and the price was as low as 2s. 3d.; the length of mains being 338 miles. By 1905, the price of gas was reduced to 2s., at which low figure it remained until the war made an increase necessary. It is now 2s. 4d. Coming to 1916, the expended capital stood at £1,561,805, and the reserve at £137,595. The amount of coal carbonized was 253,283 tons, the gas made 2961 million cubic feet, and the selling price 2s. 6d. for part of the year, and then 2s. 4d. The consumption of gas during the hours of daylight was 1569 million cubic feet. The storage capacity of the holders was 15 million cubic feet, the mileage of mains 378, the number of consumers per mile 178, the total number of meters in use 67,428, prepayment meters 32,244, cookers on hire 56,768 (the hiring-out of cookers began with 20 in 1891), and public gas-lamps 2812. Before the war, in 1912, there were 9822 public gas-lamps. Since then there have been extensions of electric lighting; and the great reduction at present is due to lighting restrictions.

Price of Gas at Ellesmere.—A Special Committee appointed by the Ellesmere Urban District Council to deal with the price of gas have reported that statistics submitted by the Clerk show the present actual cost to the Council of producing gas is 3s. 11d. per 1000 c.ft. The Council agreed, after some discussion, to increase the price of gas from 3s. 6d. to 4s. 2d. per 1000 c.ft., and to make a subsidy of £150 from the general account to the gas account, to meet the liabilities up to the end of this year.

Public Lighting after the War.—In presenting the annual statement of income and expenditure at the meeting of the Plymouth Town Council yesterday week, Mr. Godding, the Chairman of the Finance Committee, said that through the darkened streets they had saved £7052 last year; and the Committee were not allowing for any increase of lighting in the coming year. Alderman Phillips criticized the policy of the Finance Committee in this matter, and said that immediately the war was over they would have to allow for an expenditure of £10,000 on public lighting, which would increase the rates by 2½d. in the pound. Alderman Woollcombe expressed the opinion that people would be content for some time after the war to see the present economy continued. The action of the Finance Committee was confirmed.

Leicester Gas Profits and the Rates.

Moving the adoption of the Gas Committee's report at a special meeting of the Leicester Town Council, Mr. Hilton said, with regard to the Committee's suggestion to devote £5000 of the profits to the relief of the rates, the members were divided. The Committee would be only too pleased, in one sense, if the whole of the surplus were devoted to the reserve fund; but there were members—and he confessed he was one of them—who believed that these trading departments should hand over some contribution to the rates, if they found they were able to do so. In the circumstances he thought that they would be doing the correct thing if they adopted the Committee's suggestion. Mr. Murby, in moving as an amendment that the whole of the net surplus gas profits for the past year be placed to reserve, said it was a bad policy to hand over gas profits to relieve the rates. He prophesied that, if the Committee's recommendation were carried, another increase of 3d. or 4d. per 1000 c.ft. in the price of gas would have to be made during the year. This simply meant taxing one section of the community in order to relieve the pockets of the direct ratepayer. Mr. Wilford, who seconded, said he did not believe in handing over balances from public undertakings for the relief of the rates. He hoped they would use the public undertakings for the benefit of the public, and not allow them to be regarded as the milch cow of the ratepayers. Alderman Smith said the concern belonged to the whole of the ratepayers, and should not be run in the interests of any section. If there was a loss on the undertaking, the ratepayers would have to meet it, and not the consumers only. Mr. Gimson urged that the trading undertakings were not meant to make money for ratepayers; and Mr. Loseby said the best way to help the industries of the town was to keep down the rates. The amendment was lost, and the Committee's proposal was then agreed to.

Theft of Coal at Maidstone.—A carter named Arthur Jones has been fined 40s. by the Maidstone Magistrates for stealing 2 cwt. of coal, value 3s. 6d., the property of the Maidstone Gas Company, from a truck at the goods yard. He was employed by a contractor to cart the coal for the Company. A railway constable said he saw the prisoner filling his cart with coal from the Gas Company's truck, and afterwards saw the man in the truck filling a bag with coal, which he placed on top of his cart. After he left the yard, another constable, seeing there was something in the cart covered with a horse-cloth, pulled the cloth aside, and found two bags of coal. He asked prisoner what he was going to do with the coal; and he replied, without hesitation, "I am going to take it home. I got it from the goods yard; and it is only a few sweepings. I thought there would be no harm in that." Giving evidence, prisoner said he cleared up some "sweepings" under the trucks. He thought it better than wasting the coal. He asked no one's permission to take the coal. In answer to this it was stated that no one had any right to take the sweepings. They were cleared up every day by men in the yard.

The "Fire Queen"

The Latest "Main" Gas Fire.

It is designed to co-ordinate in size with *any* modern Interior Grate.

The fire backs and heights over-all are graded to coincide with the dimensions of Standard Grates. Note the appearance when in use. So like a bright coal fire, and it will pass all the "tests" for Efficiency and Ventilation.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Proposed Extension of Automatic Lighting in Edinburgh.

In November last [see "JOURNAL," Vol. CXXXVI., p. 302] a demonstration of the Alder and Mackay system for automatically lighting and extinguishing street lamps was carried out in Edinburgh; and since that time the 65 lamps fitted with the apparatus have been in nightly use up to 7 o'clock. Recently, however, permission has been given by the military authorities to extend the hour to 10 o'clock. In order to ascertain whether it is possible to extinguish the lights within about a quarter-of-an-hour of receiving a warning of an air-raid, a number of surprise alarms have been made, the tests in every case proving satisfactory. The Lighting Committee of the Edinburgh Corporation have been so pleased with the new system that the question of extending it was discussed by the Committee on the 12th inst., when it was proposed to have 300 more lamps, in the area controlled by the same governor, fitted with the automatic apparatus. The matter was remitted, with powers, to a Sub-Committee, who are expected to make a recommendation on these lines to the Town Council. There can, says our correspondent, be little doubt that the man-and-torch method is doomed—it is only a question of time.

Labour Shortage at St. Mary Church Gas-Works.—In his report to the last meeting of the Torquay Town Council, Mr. F. Chalmers, the Manager of the St. Mary Church Gas-Works, stated that in January the demand for gas increased by 487,000 c.ft.—the first increase in 18 months. The shortage of labour was such that at any time the continuous supply of gas might be endangered. There were not men enough to deal with the work; and when one stoker was away ill the stock of gas went down seriously, and the occurrence of another case of illness would have put them in an alarming condition. Ammoniacal liquor sufficient to make three tons of sulphate was in store, but could not be worked up for want of labour. In the fitting department the last apprentice was on the point of leaving, and the only fitter left had been called up.

Faulty Construction of Geyser Ventilation Flues.—A verdict of "Accidental death" was returned at an inquest at Plymouth yesterday week on Mrs. Laura Rendle, aged 43, who was found dead in the bath at her residence. The bath was heated by a geyser; and the medical evidence was that death was due to gas poisoning. Mr. J. A. Richmond, the Outdoor Superintendent to the Plymouth and Stonehouse Gas Company, said the geyser had a ventilation flue; but there was no baffle plate in the flue to prevent down-draughts. He imagined the burner had been turned low and that the draught down the flue extinguished the light. Builders usually fixed geysers in this way; but the Gas Company when they had the fixing to do always put in a baffle-plate. The Coroner (Mr. R. B. Johns) said he was informed that the Gas Company were prepared to send competent men to inspect geyser installations without making any charge; and if people would avail themselves of this offer there would be no danger of such regrettable accidents.

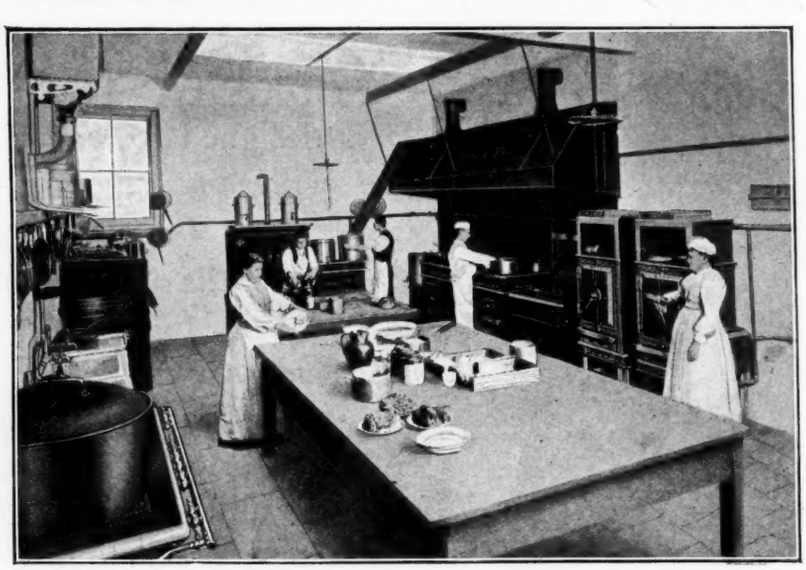
Cromer Gas Company.

The Directors of the Cromer Gas Company regret to report that the results of the past year's business show no appreciable mitigation of the serious losses sustained by the Company owing to the war. The profits have also been adversely affected by the continued increase in the cost of coal and of nearly all the materials used by the Company, and by an advance in wages necessitated by the enhanced cost of living, &c. Compared with the year 1915, the sale of gas, the revenue from gas and from meter and stove rental, and the receipts from the sale of residual products show small increases; but compared with the results for 1913, the last pre-war year, the sale of gas has declined by 5,217,200 c.ft., or 20 p.ct., the revenue from gas and from meter and stove rental by £866, and the receipts from the sale of residual products by £271—a total reduction of revenue of £1137. The Directors, ably seconded by the Engineer and Manager (Mr. Samuel Carpenter), have been unsparing in their efforts to promote every possible economy in carrying on the business. The carbonizing and general working results have been very satisfactory, and afford evidence of the efficiency and assiduity with which the Engineer has carried out his duties. For upwards of twenty years, the Company have been in debt to their bankers for cash advanced. During the past year, however, the outstanding loan had been reduced from £1500 to £250; and the Directors have the satisfaction of reporting that the final balance of £250 was repaid in January. The accounts show that, after meeting interest, income-tax, and all other charges, there remains a balance to the credit of the profit and loss account of £626. It is with a feeling of gratification that the Directors find themselves in a position to recommend the declaration of a dividend for the year ended Dec. 31 last, of 1 p.ct. (less income-tax). The payment of the dividend and the tax will require the sum of £444, and leave a balance of £182 to the credit of the profit and loss account to be carried forward.

Price of Gas Raised at Ipswich.—The Ipswich Gas Company announce an advance in the price of gas which will make the figure 3s. per 1000 c.ft., as from the March meter-readings.

Burnley Charges Increased.—At a meeting of the Burnley Town Council, Alderman H. Emmott, J.P, (the Chairman of the Gas Committee), stated that they were faced with a big deficit for the next twelve months, owing to the serious rise in the price of coal and materials of all kinds, and also the increase in wages. The deficit was likely to be about £14,650, and it might be more. The Committee proposed increasing the price of gas 3d. per 1000 c.ft. for motive power, and 4d. for ordinary meters, with a corresponding reduction in the amount allowed for 1d. through prepayment meters. The increased charges would bring in £11,000 or £12,000 towards the prospective loss; and if anything further were needed, it must come out of the reserve fund. They could not forecast what would happen in the next twelve months with regard to coal and oil. The increased charges were sanctioned.

Industrial Canteens.



The impetus given to the Industrial Canteen movement by the Committee on the Health of Munition Workers has opened up a large field for the Installation of Gas Cooking Apparatus. The above example is typical of many Kitchens equipped by Richmond's for providing complete meals to a large number of employees.

THE RICHMOND GAS STOVE & METER CO., Ltd.,

Academy Street, Warrington. 132, Queen Victoria Street, E.C.

Manchester and the "Leeds Judgment."

Alderman Richard Burtles, the Deputy-Chairman of the Manchester Gas Committee, presided at last Friday's fortnightly meeting, when it was reported that a sum of upwards of £75,000 was payable by the city fund to the trading departments of the Corporation—gas, electricity, tramways, and markets—under the award of the Arbitrator (Mr. Leonard Douglas Kidson, A.C.A., of Manchester), appointed to determine the adjustment in respect of the income-tax recovered by the Corporation under what is now widely known as the "Leeds judgment." Of this sum, he estimated that about £20,000 would be payable to the credit of the gas revenue account. The Superintendent (Mr. F. A. Price) pointed out that the relationship of the Gas Department to the general income-tax assessment of the Corporation was first raised some years ago; but in view of the comparative smallness of the tax in pre-war days, the matter was not pressed. This recovery of the tax from the city fund, Mr. Price stated, was due to the vigilance of the officials of the trading departments, who have met continually during the last eighteen months for the purpose of deciding upon a joint policy in regard to income-tax payments on their profits and properties.

Gas Profits at Manchester.

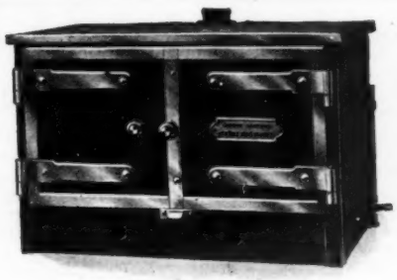
At a meeting of the Manchester Gas Committee on Friday, under the presidency of Alderman Richard Burtles, the Deputy-Chairman (in the absence through indisposition of Alderman William Kay, J.P., the Chairman), lengthy consideration was given to a request of the recently-appointed Special Committee on Trading Profits for information as to what contribution the Gas Committee would be in a position to make out of their profits in lieu or in aid of the city rates for the financial year 1917-18. In 1914, the Department agreed to contribute £50,000 annually for three years; and the arrangement concludes at the end of this month. In view of the increased cost of coal, the effects of restricted lighting, the payment of war bonuses, and other special war expenditure, the ratepayers of the city had not altogether viewed matters with equanimity; but hardly anyone outside official circles was prepared for the resolution unanimously agreed to by the Committee—"That, inasmuch as it is probable that there will be a deficiency of £100,000 on the gas revenue account at March 31, 1917, the Committee cannot see their way to make any contribution in aid of the rates next year." The subject of the appropriation of gas profits at Manchester was referred to in the last number of the "JOURNAL" [pp. 502-3]; and the Gas Committee's decision will doubtless be discussed at the Council meating on April 4, when it is expected that the reports of the three other Trading Committees will be presented. The Finance Committee of the Corporation are, it is thought, likely to use their influence with the Gas Committee to induce them to modify their decision not to make any contribution; and in this eventuality the Committee would be compelled to raise the price of gas, which to-day is 2s. 8d. per 1000 c.ft., less 2d. if paid in a month. As the production of a penny rate for municipal purposes in Manchester is £18,785, the effect of the loss of the Gas Committee's £50,000 would be to increase the city rates by nearly 3d. in the pound.

Dearer Gas at Seaford.—The Seaford Gas Company, Ltd., have written to the Urban District Council stating that, owing to the abnormally high current rates for coal, &c., the Directors regret they are compelled to advance the price of gas from the Lady-day meter readings 6d. per 1000 c.ft. (making the standard price 5s. 1d.), which is equal to an advance of 5¼d. to the Council, thus making the present price 4s. 6¼d. net.

Price Increased in the Wandsworth, Wimbledon, and Epsom District.—The Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company regret to have to give notice that, owing to the high cost of coal and other materials, restrictions of transport, rise in wages and war bonus allowances, and other matters, the price of gas must be increased by 6d. per 1000 c.ft., to date from the taking of the meter-indices at the Lady Day quarter. The new price (which, the notice points out, will be found to be lower than that charged by any similar company round London) will apply to consumers in all areas supplied by the Company, in conformity with their Act of 1912.

Gas Company's Carter and Military Service.—Mr. S. J. Ingram, the Manager of the Truro Gas Company, appeared before the Cornwall Appeal Tribunal yesterday week in support of an appeal by the Company against an order by the Truro Tribunal that G. Appleton, a carter in the Company's employ, should join up on April 1. It was contended that the man was in a certified occupation; and as 25 p.ct. of the employees had joined the forces, no more men could be spared. The Ministry of Munitions had been appealed to, and had replied that as the man was in a certified occupation it was not necessary that he should be badged. On behalf of the Military it was urged that the local Tribunal were fully acquainted with the facts, and had unanimously decided that the man should go. The Appeal Tribunal overruled technical objections taken by both sides; and on a review of the evidence decided that the man must join up on April 1.

Reduced Consumption at Torquay.—The report of the Directors presented to the annual meeting of the Torquay Gas Company on Thursday last stated that the sale of gas had been adversely affected to the extent of 3½ p.ct. by the operation of the Daylight Saving Act, the earlier closing of shops, and the desire of the public to economize. Mr. A. Iredale, the Vice-Chairman, who presided, said, however, that the sales had increased this year and the loss had been almost recovered. The accounts showed increases in the cost of coal from £19,297 in 1915 to £21,022, and in oil from £1754 to £2948. The total cost of manufacture was £30,631, against £27,381—an increase of £3250. The receipts were £44,809, against £42,233; the increase of £2576 being mainly due to the advance in the price of gas. Many difficulties were experienced in working, especially in keeping up the supply of coal; while the cost of everything they required to buy had advanced by from 20 to 300 p.ct. It was mentioned by Mr. W. Aitken, who was re-elected a Director, that an increased price was likely to be obtained for tar as the result of a pooling arrangement with the Plymouth Gas Company.



No. 2,800. Hot closet constructed of steel plate and has hot-air jacket round sides.

Keep your Workmen "fit"

by catering for them with

CARRON

Gas COOKING APPARATUS

pronounced by the catering world to be unequalled for strength and efficiency

CARRON COOKING APPLIANCES have been adopted by the leading HOSPITALS, INFIRMARIES, HOTELS, WORKS' KITCHENS, MILITARY CAMPS, etc.

Undernoted are a few; there are many others:—

Royal Naval Barracks, Chatham.
Guards Canteen, Pirbright Camp.
H.M. Navy.
Royal Artillery Mess, Shoeburyness.
Army and Navy Stores, London.
British Aluminium Co., Ltd., Kinlochleven.
Woodilee Asylum, Glasgow.
Leeds Infirmary.
Royal Naval College, Osborne, I.O.W.
Craigleith Poorhouse, Edinburgh.
Ritz Hotel, Piccadilly, London.

The Company's illustrated catalogue should be in the hands of all Munition and other Manufacturers. Write for a free copy to-day.

By Appointment.

CARRON COMPANY

Works: CARRON, STIRLINGSHIRE.

Branch Works: PHŒNIX FOUNDRY, SHEFFIELD.

No. 735. Multitubular water boiler, gives a good supply of boiling water for tea making, etc.

A sum of £4000 will be available for the reduction of the Walsall rates from the profits of the gas undertaking for the ensuing financial year.

Owing to lack of coal the gas lighting of Athens and the Piræus is stated to have been completely suspended. Since last Tuesday one gas-lamp in three has been extinguished in Madrid; and a published letter from an Englishwoman living in Switzerland says the gas supply there has been cut down.

Any misapprehension that gas cooking-stoves are recent innovations will, the "Essex County Telegraph" remarks, be corrected by the perusal of a paragraph published in 1855, and now reprinted. This relates to an explosion in the oven portion of a gas cooking-stove, through the turning-on of the wrong tap. The stove was "completely demolished."

The Education Committee of the London County Council report that during the past session, notwithstanding the war, the class for gas-fitter apprentices held in connection with the Gas Light and Coke Company at the Westminster Technical Institute has been continued on the same lines as formerly. The increase of wages to first-year apprentices granted by the Company has had the effect of keeping up the attendance.

The Directors of C. & W. Walker, Ltd., report that the profit for the year ended Jan. 31 last, after charging Directors' fees and depreciation on buildings and plant, amounts to £13,937; and adding the balance brought forward, there is a sum of £26,028 standing to the credit of the profit and loss account. The Directors recommend the payment of a dividend of 10 p.ct. per annum (free of income-tax) on the ordinary shares, with a bonus of 1s. per share (also tax free). After placing £5000 to the reserve fund (making it £50,000), there will be a balance of £11,435 to carry forward.

At the annual meeting to day, the Directors of the Davis Gas-Stove Company, Ltd., will report that the net profits for the year to Dec. 31 amounted to £20,223; and adding the sum brought forward, there is a total divisible profit of £31,041. An interim dividend on the ordinary shares at the rate of 5 p.ct. per annum was paid for the half-year to June. It is now proposed to pay a further dividend at the rate of 15 p.ct. (making 10 p.ct. for the year, less income-tax); to add £4500 to the reserve account, making it £67,000; to place £4500 to a special reserve for termination of war contingencies; to contribute £2000 to the provident fund; and after providing £1418 for the proportion of profits payable to the Directors, there will remain £11,102 to carry forward.

STOCK MARKET REPORT.

THE Stock Exchange has had quite a cheerful week, in spite of the paucity of business, which—as has been before explained—arises not from lack of would-be buyers but from shortness of stock. Indeed, it would be strange if even the most pachydermatous pessimist were not penetrated by a bright ray in a week which began with Baghdad and ended with Bapaume. But the great event, of course, was the revolution at Petrograd; and of this it may be said that in every business circle throughout Great Britain the news has been hailed with satisfaction that at last the great Russian people are determined to excise from the body corporate of the nation the German cancer which has so long been eating into its vitals, and to bring the whole of their enormous strength to aid in the victorious conclusion of the war.

The gilt-edged market more than maintained its strength. Home Government issues, and Indian and Colonial as well, were very strong. Home Rails showed great firmness, especially prior charges, but were unable to respond to the demand. Americans were only moderate, but closed steady, and some Canadians improved. The tone in Argentines continued favourable. The Foreign Market was irregular. Chinese, Japanese, Chilians, and Brazilians were strong points. The position of Russians was not injured by the grave events of the week; the value of the rouble having advanced. Among the other markets there was something almost approaching activity. In Rubber, it looked as if people were preparing for an approaching boom; Oil was better; and Textiles and Shipping were steady.

Business in the Gas Market was on a fair scale, but curiously capricious. Wednesday's transactions almost balanced the total of the rest of the week, of which one or two days were almost a blank. Prices realized seemed rather to indicate some tendency towards a rise in values, and a noticeable feature was an increase in the activity of prior-charge issues. The easy condition of the Money Market was maintained. In the Stock Exchange, the election of the new Committee is taking place to-day. Indications point to the House being pretty well purged of members of enemy origin.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 64¾, 65, 65¼, 65½, 65⅝, South Metropolitan 74½, ditto debenture 55, 55½, Southampton 77, 77½. On Tuesday, Bombay 4 15/16, European 10¼, Gas Light ordinary 65, 65¼. On Wednesday, Brentford debenture 67, British debenture 66¾, 66½, Commercial 4 p.ct. 71, ditto 3½ p.ct. 66, ditto debenture 52½, Continental Union 37, Gas Light ordinary 64⅜, 65, 65¼, 65⅜, ditto maximum 55¼, 55½, ditto preference 67½, 68, ditto debenture 55, Imperial Continental 67, 69, ditto debenture 58½, 59, Primitiva 42s. 6d., ditto preference 61s. 3d., South Metropolitan 74. On Thursday, Barnet "A" 137¼, 138, ditto "D" 99½, 100, Commercial debenture 54, Continental Union 38, Gas Light ordinary 64¾, 65, 65¼, 65⅜, 65½, ditto preference 68½ ditto debenture 55½, Imperial Continental 68, 68½, Primitiva preference 58s. 9d., South Metropolitan 74¼, 74½, 75. On Friday, Gas Light ordinary 65, 65¼, 65½, ditto preference 69½, 70. On Saturday, Gas Light ordinary 65, 65⅜, 65⅜, ditto preference 70, Imperial Continental 67, 67½.

The Bank rate is 5½ p.ct., as fixed on the 18th of January.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref. .	..	58—63*	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	62—64	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4.6	Bombay, Ltd.	5¼—6¼	4¼—5¼	4⅛
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	24—30	24—26*	..
3 3 110	10	,,	7	7/-	B 7 p.c.	15—15½	10½—11¼*	..
115,000	10	,,	6	6/.	Pref. 6 p.c.	13½—14	9¼—9½*	..
159,740	—	,,	—	4%	4 p.c. Deb.	..	71—73	..
932,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid. .	261—266	83—85	..
734 920	,,	,,	11	53/9	Do. B New . .	204—209	80—83	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	83—88	..
221 400	,,	June 11	4	4%	Do. 4 p.c. Deb. .	91—93	67—69	67
217 380	,,	Feb. 26	11	10⅞†	Brighton & Hove Orig. .	208—213	157—162*	..
244,200	,,	,,	8	7⅞†	Do. A Ord. Stk.	154—159	112—117*	..
530 000	20	Mar. 26	12½	22/6	British	44—45	33½—34½	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk..	88—90	66—68	66¼—66½
215 771	,,	,,	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	57—60	..
100 000	10	,,	—	—	Cape Town & Dis., Ltd.	1½—2½	1¼—1¾	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref. .	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	58—63	..
157 150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk. .	106—108	71—73	71
560 000	,,	,,	5½	46/8	Do. 3½ p.c. do. .	103—105	65—68	66
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	52½—54
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	36—38	37 38
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	58—60	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c..	..	170—180*	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	,,	6	5½%†	Derby Con. Stk. . . .	123—125	100—105	..
55 000	,,	—	4	4%	Do. Deb. Stk. .	102—104	80—83	..
1,032,180	10	July 29	10	7/6	European, Ltd. . . .	17½—18	9½—10½	10½
16 313 430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. . .	98—102	64—66	64⅜—65⅞
2,600 000	,,	,,	3½	3½%	3½ p.c. max. . .	76—79	54—57	55¼—55½
4,054,235	,,	,,	4	4%	4 p.c. Con. Pref.	95—99	65—70	67½—70
4,674 850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	54—56	55—55½
130 000	,,	,,	10	10%	10 p.c. Bonds .	..	..	..
2 8,740	,,	Mar. 12	5	4⅓%†	Hastings & St. L. 3½ p.c.	87—89	76—81*	..
70 000	10	April 29	11	6%	Hongkong & China, Ltd.	16¼—16½	8—9	..
86,600	—	—	—	9½%	Hornsey 7 p.c.. . . .	..	120—130*	..
131,000	Stk.	Mar. 12	7⅝	7⅛%	Ilford A and C. . . .	151—154	102—107*	..
65,780	,,	,,	6⅜	5⅞%	Do. B	115—118	80—85*	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb . . .	92—94	71—74	..
4,910,000	,,	May 14	9	4½%	Imperial Continental .	150—160	66—71	67—69
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	58—61	58½—59
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c. .	119—121	85—90*	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—213	81—83	..
					{ B	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4¼—4⅝	3⅝—4¼	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	99—100	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11¼—12	8—8½	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle & Gateshead Con.	98½—99½	73½—74½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7/9†	North Middlesex 7 p.c. .	14—15	10—11*	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	105—107	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7¼—7⅜	2—3	..
60.000	50	Feb. 26	13	12%	Portsea, Island B . .	128—131	92—97	..
100,000	50	,,	12	11%	Do. C . .	118—121	85—90	..
52,000	50	,,	10	9%	Do. D . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	1⅞—2⅛	42/6
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref. .	4¾—5	55/—65/-	58 9—61/3
521,600	100	June 2	4	4%	Do. 4 p.c. Deb. .	91—93	78—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb. .	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref..	10¼—11	8—8½	..
125,000	50	July 1	5	5%	{ 5 p.c. Deb..	47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	188—192	..
203,984	,,	,,	10	10%	Do. B	223—224	188—192	..
529,500	,,	,,	10	10%	Do. C	220—222	188—190	..
90,000	10	May 28	9	6/-	South African.	10¼—11½	..	..
6,609,835	Stk.	Feb. 10	5/4/0	46/8†	South Met. 4 p.c. Ord. .	111—113	73—75	74—75
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb. .	72½—74½	54—56	55—55½
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	144—146	..
954,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	7—78*	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref. . .	110—112	77—79*	..
135.000	,,	—	—	48/4	Do. West Kent . . .	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord. . . .	99—102	77—79	77—77½
120,000	,,	Feb. 12	7½	7½%	Tottenham and District { A 5 p.c. .	135—138	95—100	..
782,275	,,	,,	6	5⅝%	{ B 3½ p.c. .	115—117	68—73	..
181,255	,,	June 26	4	4%	{ 4 p.c. Deb.	87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	103½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	80/-†	Wandsworth A 5 p.c..	151—156	114—119*	..
255 636	,,	,,	6¾	65/-†	Do. B 3½ p.c. .	129—134	99—101*	..
108,075	,,	,,	5/17/8	56/-†	Do. C 3½ p.c. .	110—115	86—91*	..
352,000	,,	,,	8½	58/9†	Wimbledon 5 p.c. . .	117—122	88—93*	..
98,000	,,	,,	6⅜	65/-†	Epsom 5 p.c. . . .	121—126	96—101*	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk. . .	66—69	51—54	..

* Ex. div. † Next dividend will be at this rate.